The Electrical Review

VOL. CIII. OCTOBER 26, 1928. No. 2,657.

THE OLDEST ELECTRICAL PAPER. ESTABLISHED 1872.

Published every FRIDAY, Price 6d.

Chairman: H. ALABASTER.

Technical Editor: A. H. ALLEN, M.I.E.E. *Joint Managing Directors:* G. H. ALABASTER. E. A. GATEHOUSE M.I.E.E., A.M.Inst.C.E. *Commercial Editor:* A. H. BRIDGE.

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OFFICE: 4, LUDGATE HILL, LONDON, E.C.4.

Telegraphic Address "AGEKAY, CENT., LONDON," Code, A B C. Telephone No.: Central 8871 (5 lines).

The "Electrical Review" is the recognised medium of the Electrical Trades, and has by far the Largest Circulation of any Electrical Industrial Paper in Great Britain.

SUBSCRIPTION RATES, Postage Free: United Kingdom, £1 14s. 8d.; Canada, £1 12s. 6d. Colonial and Foreign, £2 1s. 6d. per annum. Cheques and Postal Orders (on Chief Office, London) to be made payable to THE ELECTRICAL REVIEW, LIMITED, and crossed "Midland Bank, Newgate Street Branch."

For List of Foreign Agents for the ELECTRICAL REVIEW see Advertisement Supplement.

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Rural Electrification.

THE "rural electrification" season may be said to have opened, as Mr. S. E. Britton, chairman of the Mersey and North Wales (Liverpool) Centre of the Institution of Electrical Engineers, took that subject for his inaugural address on Monday last, and the Overhead Lines Association held its annual meeting last week, when Mr. R. Borlase Matthews, the retiring president, delivered an address on "Overhead Lines Progress." Mr. Britton, who has done excellent work in the development of rural electricity supply in his own area and has taken a prominent part in the movement to cheapen overhead line construction, which bore fruit in the revised code of regulations issued in April this year, states that "still further relaxation is necessary to enable the supply to be extended to the utmost limit," and that the preliminary expenses of rural electrification definitely hinder progress. He points out that whilst more than half the "rural area" of the country is included in areas of supply, the bulk of the population in that area is not provided with electrical service, only those residents adjacent to an electric line being catered for. Many of the supply authorities, unfortunately, show little inclination to serve the rural communities; rural electrification, in fact, does not in general appeal to the urban authorities, though they are better situated to deal with it by extending beyond their existing boundaries than new *ad hoc* undertakers would be. It is not easy to devise a tariff which will ensure an adequate return upon the capital expended, but it is easy enough to incur a permanent loss; to guard against the latter, Mr. Britton has adopted the plan of ascertaining from residents in his area the amounts they spend on oil and fuel, and in this way has gathered valuable data as to the spending power of the inhabitants. Consumers are offered a two-part tariff, subject to a guaranteed minimum annual payment of the order of 20 per cent. of the expenditure; this not only ensures that the supply shall be remunerative, but also induces the consumer to install electrical apparatus which will enable him to use electricity up to the full value of the guaranteed amount. The result has been that the value of land near distribution lines has increased, hundreds of new houses have been built, many families have moved into the area, employment

has improved, and farmers wonder "how they got on without electricity." This is a very satisfactory showing—but Mr. Britton is careful to chart the snags, and emphasises the urgent necessity of cheaper wayleaves and the greatest facilities for the construction of overhead lines.

Mr. Matthews devoted his attention rather to the technical aspect of overhead line construction, pointing out that "safety at excessive cost prohibits the free use of electricity," and arguing in favour of reasonable safety coupled with low cost of distribution—the policy which we have long advocated. He pointed out that the Electricity Commissioners had often granted special relaxations from their rules to those engineers whom they knew to be really competent, and this fact, too often overlooked, should be borne in mind; the Commissioners are well aware that in many situations the strict interpretation of their regulations would be as unreasonable as it would be superfluous—the regulations are not as the laws of the Medes and Persians. The most noteworthy features of the address (which is abstracted elsewhere in this issue) were the detailed references to the possibilities of greatly cheapened pole-line construction "in accordance with modern engineering practice instead of being based on the Electricity Commissioners' regulations." This allusion, like Mr. Britton's remarks, places the existing regulations in a very unfavourable light. The author gave data in illustration of his point, prepared by Dr. A. Ekström, who has contributed somewhat similar data to our pages, and we commend them to the attention of our readers who are interested in the subject, as they are of great importance to the future progress of rural electrification. Further, we would urge readers to study carefully the remarkable article by Mr. J. A. Sumner, which was printed in our issues of September 21st and 28th; at first sight it might appear that this article differed little in substance from previous articles of a similar nature, but that would be an illusion. In point of fact, it reveals a new principle of great value to the overhead line engineer, conducing not only to facility in design but also to economical construction, and we believe it will amply repay the most careful consideration.

Honours to Edison.

On Saturday last an exceptional honour was conferred upon Mr. Thomas Alva Edison, when a gold medal specially voted by Congress in recognition of his many inventions was presented to him in his laboratory at West Orange by Mr. Mellon, Secretary of the Treasury. At the same time, President Coolidge delivered an address in honour of the occasion, which was broadcast from White House. Mr. Edison, who is in his 81st year, briefly expressed his appreciation of the honour, the appropriateness of which will be recognised throughout the world; every electrical man, at any rate, will heartily endorse the President's concluding words: "May you long be spared to continue your work and inspire those who will carry forward your torch!" A portrait of "The Wizard" appears on p. 705 of this issue.

This interesting event reminds us of the impending jubilee of the invention of the incandescent electric lamp, which, more than any other appliance, was responsible for the rapid development of electrical science and industry during the latter part of the nineteenth century. The first definitely successful electric glow lamp was produced and exhibited by our fellow-countryman, Joseph Wilson Swan, at Newcastle-upon-Tyne in December, 1878; but both he and Edison had been working on the subject long before that date. On October 5th, 1878, Edison claimed success, with a metallic-filament lamp, but it proved a failure; it was in the following year that he produced a lamp with a carbon filament.

Wednesday next, October 31st, is the 100th anniversary of the birth of Sir Joseph Swan, whose inventions have meant so much to the electrical industry.

Selling Electrical Goods.

In our issue of October 5th, Mr. E. Kilsby Muir contributed an article in which he showed that there was something radically wrong with the methods at present in vogue in the electrical trade for the warehouse stocking of goods, and for serving trade counter customers ("Stocking and Trade Counter Selling," Elec Rev. p. 550). We suppose that most of our trade readers have time and time again experienced inefficiency in such connection when they have been making purchases, receiving deliveries, and settling accounts. Sometimes one has found want of organisation and at others excessive pettifogging over-organisation. In these days when there are so many writers of non-electrical experience who are eager to tell the trade what its shortcomings are, and to advise the adoption of certain sometimes fanciful methods purely because they have proved suited to another class of trade, it is useful to have the views of a man of wide and prolonged practical knowledge of commercial electrical organisation in various directions, and particularly in that to which we have specially referred. We hope that Mr. Muir's suggestions of means by which improvement may be brought about, enabling suppliers to give more adequate service to their customers, will continue to receive attention, and we invite readers to contribute their experiences and views on the subject generally.

The arrangement and organisation of electrical showrooms for the public convenience is really closely akin to the above matter. Electricity supply officials and contractors have thought out all kinds of ways in which to "catch the eye" and promote the interest of the potential consumer. Happily we can quote a number of outstanding examples where policy on the grand scale has been pursued and popular interest has been aroused; there may have been cases where things have been overdone, and criticism has followed, but there are certainly places where the showroom effort has been badly done and others where no effort at all has been made. An active organisation operating simultaneously with a well-placed and well-ordered showroom will go far to keep the domestic electric pot boiling. We suppose that, generally speaking, where a good display is made, those behind it have appreciated the importance of the personal element—the staff efficiency factor. That it is not always so we have proved for ourselves at times, and could quote cases where the public visitor has left a showroom with his previous *opinion* that electrical appliances were expensive, turned into an absolute *conviction* because an attendant has "seen him coming" and drawn his attention to high-priced goods. When shall we learn that personal dress and appearance are often no true guide as to means?

The British Electrical Development Association devoted last Friday's London Conference to a paper by Mr. W. Millner on "Organising for Better Selling in Electrical Showrooms." We report the matter briefly on another page. Mr. Millner emphasised a number of points which require frequent repetition. What folly it seems to all of us that an excellent exhibition or showroom should be situated in the wrong place! Seeing that its chief purpose is to make contact with the public, a main shopping thoroughfare is the correct situation. Then, how important it is to secure the right atmosphere in which the public will feel at home, and to provide adequate facilities for demonstration and quick-selling, without overcrowding; also to have numerous plug points to impress upon the lay mind the facility with which outlets can be added. Other matters stressed by the author were the selection of a suitable staff; the holding of suitable stock; the frequent changing of window displays featuring quick-selling lines for which there should be general demand; and, what is by no means unimportant, especially in large areas, the opening of suitably located small showrooms in close touch with the large central one at headquarters.

The Maentwrog Hydro-electric Scheme.

Descriptive details of recent developments of the North Wales Power Co., Ltd., with particular reference to its new water-power plant in the Afon Prysor Valley, with an initial capacity of 22,500 kVA.

AUTHORISED by its Parliamentary Act of 1904 to supply electricity in bulk for power purposes within the four North Wales counties of Caernarvon, Merioneth, Anglesey, and part of Denbigh, the North Wales Power and Traction Co., Ltd., commenced in 1905 to construct its original works (contractors: Bruce Peebles & Co., Ltd.) for generating energy hydro-electrically from Llyn Llydaw and the watersheds of the Snowdon Mountain range (rainfall varying from 125 to 193 in. per annum, the heaviest precipitation in Great Britain). The first station built at Cwm Dyli, Beddgelert, has been in continuous operation since August, 1906, when four 1,500-kVA sets were installed; a 2,000-kVA set was added in 1923, all the 50-cycle, 3-phase, 500-r.p.m. generators having directly-coupled exciters, and are driven by horizontal impulse water turbines under a 1,130-ft. head. The available catchment area limits the output of the station to from 8 to 10 million kWh per year.

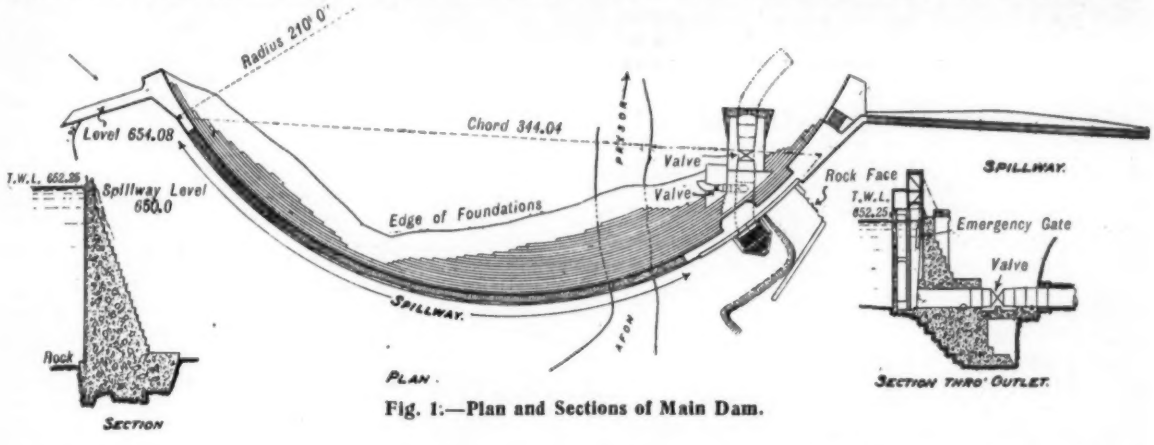


Fig. 1.—Plan and Sections of Main Dam.

A development scheme formulated by the North Wales Power Co. formed the subject of a public inquiry by the Electricity Commission in conformity with the Electricity (Supply) Act, 1919, and resulted in the issue of an Order in August, 1923, constituting the North Wales and South Cheshire Electricity District and establishing a Joint Electricity Authority therefor. Certain powers, rights, and obligations of the J.E.A. were transferred by deed to the North Wales Power Co., which now operates under the provisions of its 1904 Act and the above-mentioned Order in an extended area of 4,080 sq. miles under the chairmanship of Mr. K. M. Clark, its engineer and manager being Mr. G. K. Paton, M.I.E.E., and its consulting engineers Sir Douglas Fox & Partners.

During the interim period the increasing demand on the North Wales Power Co.'s system has been met by the purchase of energy in bulk from (i) its associate, the Aluminium Corporation, Ltd., Dolgarrog, and (ii) the Mersey Power Co., Ltd., Runcorn (steam station). An entirely new 10,000-kW hydro-electric generating station constructed at Dolgarrog by the Corporation commenced operation in 1925, and the North Wales Power Co. built a double-circuit 33-kV overhead transmission line between Percival Lane (Runcorn) and its Crewe sub-station in order to supply the requirements of the London, Midland and Scottish Railway Co.'s engineering works until such time as energy became available from the new Maentwrog water-power scheme described below, which was officially inaugurated on October 15th by Mrs. Wilfrid Ashley, who was

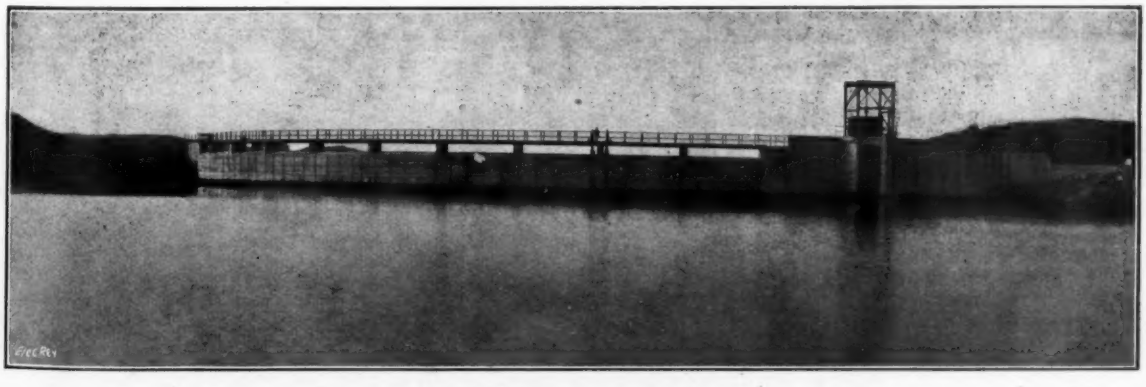


Fig. 2.—The Afon Prysor Valley Dam.

accompanied by Lieut.-Col. W. Ashley, Minister of Transport, in the presence of a distinguished gathering.

In the valley of the Afon Prysor, which joins the Afon Dwyryd near the village of Maentwrog, in the county of Merioneth, an artificial reservoir has been formed near the village of Trawsfynydd by the construction of four concrete dams: the main dam across the Afon Prysor is of the arch type (figs. 1 and 2), designed for a present spillway level of 650 o.d., which may be ultimately increased, the maximum static head at present being 630 ft. The other three are of the mass construction gravity type without spillways, and are intended to serve as "cut off" dams. The water is derived from a catchment area of 23 sq. miles, varying in altitude from 650 to 2,800 o.d., the run-off draining naturally into the lake by the Afon Prysor, but in the future leets may be constructed which will enable the drainage from other catchment areas to be diverted into the lake. The catchment area is for the most part steeply sloping and rocky, and in view of the heavy rainfall and its practically continuous distribution throughout the year, a high percentage run-off is expected to be obtained, the whole area feeding by direct and natural channels to the reservoir. The precipitation of from 70 to 100 in. per annum is equivalent to an output of from 35 to 40 million kWh per year, and the capacity of the reservoir of 1,200 million cu. ft. will suffice for continuous operation in years of minimum rainfall. The impounding of this quantity of water has necessitated the purchase of land and buildings which are now almost submerged, and also the diversion of the Dolgelly-Festiniog main road and various footpaths.

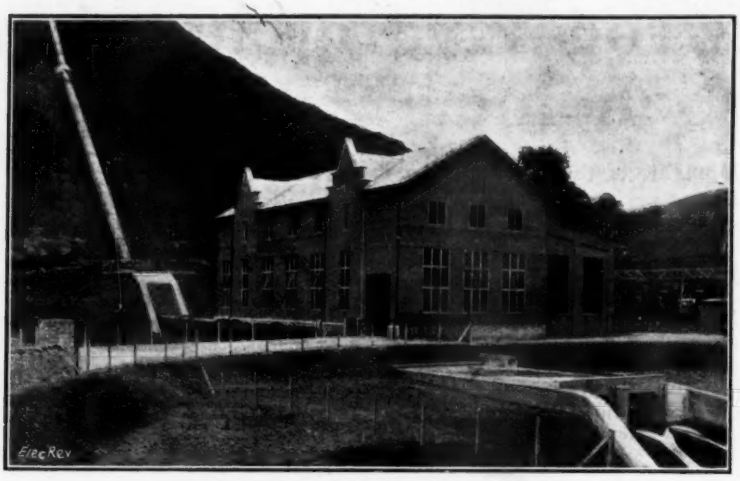
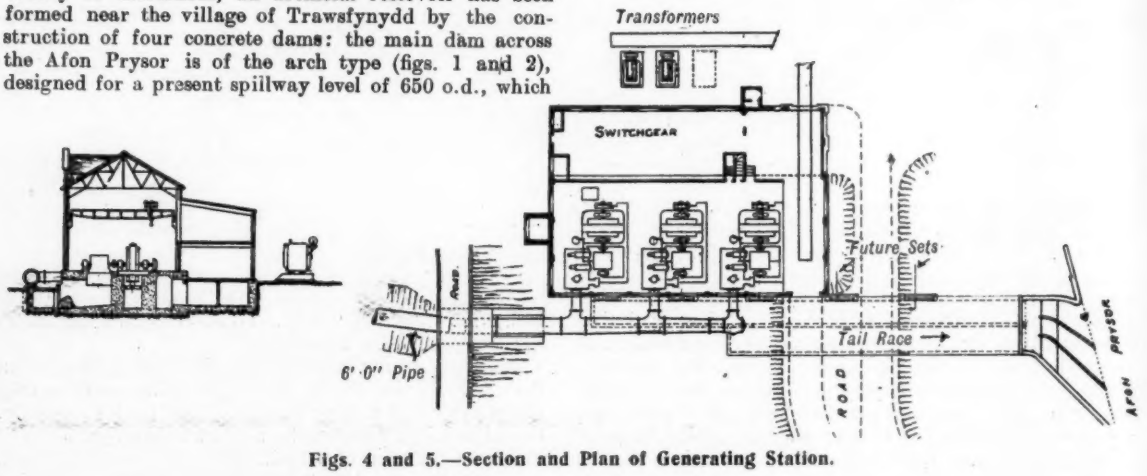


Fig. 3.—Maentwrog Water-power Station.

Water passes from the main dam intake through a screening chamber into a 30-ft. length of 10-ft. diameter steel pipe and thence into No. 1 tunnel, at the point of entry to which is fitted an 8 ft. 6 in. butterfly valve with automatic trip gear as a protection against a burst low-pressure pipe. The tunnel is of 10-ft. internal diameter, 1,920 ft. in length, was driven through rock, and is lined with concrete; an air shaft near the entrance rises above the main dam level. The low-pressure conduit between the No. 1 and No. 2 tunnels comprises a length of 5,700-ft. of 9 ft. 6 in. diameter riveted steel pipe with manholes, scour valves, and air valves. No. 2 tunnel is situated between the low-pressure conduit and the high-pressure pipe line, and is of 10 ft. diameter and a length of 1,500 ft. A surge tank, 20 ft. in diameter, at the highest point of the tunnel has been formed by excavating a vertical shaft, the ground level over the tunnel being such that only about 13 ft. of the tank is above ground. The high-pressure line was constructed of lap-welded steel pipes of 73½ in. outside diameter having parallel bump joints single or double riveted; concrete anchor blocks are placed wherever the slope changes, and inter-



Figs. 4 and 5.—Section and Plan of Generating Station.

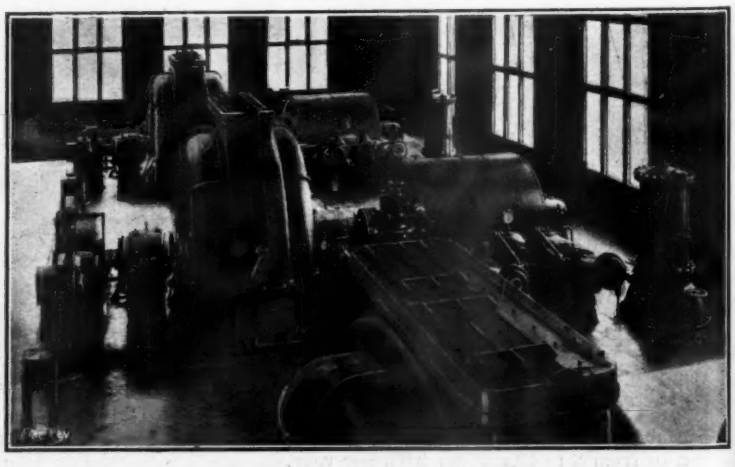


Fig. 6.—Two of the Three 7,500-kVA Turbo-generators.

Fig. 7.—Power House 6.6-kV Switchgear.

mediate concrete piers are located at intervals, expansion joints being provided immediately down stream of each anchor block and at the outlet from No. 2 tunnel, which is bifurcated so that an additional high-pressure pipe line may be laid in the future. At each outlet a sluice valve is provided to enable examination or repairs to be effected to the high-pressure pipe without emptying the tunnels and the low-pressure conduit; downstream of the sluice valve an automatic self-closing butterfly valve has been installed to operate in the event of excess velocity through the pipe from any cause.

Sir R. McAlpine & Sons were the main contractors for the hydraulic work, subcontractors being the Cleveland Bridge Co. (l.p. pipe line), South Durham Steel and Iron Co., Ltd. (h.p. pipe line), and Glenfield and Kennedy, Ltd. (valves).

The power-house building (fig. 3) is steel framed, with brick filling, and rough-cast outside; the floor level is at 22 o.d. Each of the three turbo-alternator sets is arranged across the power house (figs. 4, 5 and 6) and connected to the 72-in. diameter high-pressure pipe by a 36-in. diameter hydraulically-operated cast-steel sluice valve fixed adjacent to each machine. Each set has three pedestal bearings having bushes of cast-iron lined with babbitt metal; they are spherically seated and self-aligning, and a belt-driven pump mounted on the bed-plate provides a continuous supply of oil to them, the pump with vertical water-tube oil cooler, sump tank, and filter forming an integral part of the lubrication system.

The horizontal impulse water turbines were designed by Boving & Co., Ltd., to develop 9,000 b.h.p. each at 333 r.p.m. under a maximum static head of 650 ft. Each has two runners in a single casing and keyed to the same shaft; each runner carries 22 cast-steel buckets secured to the rim by fitted taper bolts and nuts with locking plates, the buckets being finely ground on the inside surfaces. Each runner was balanced statically before mounting on the shaft, and after mounting each pair was again statically balanced; finally,

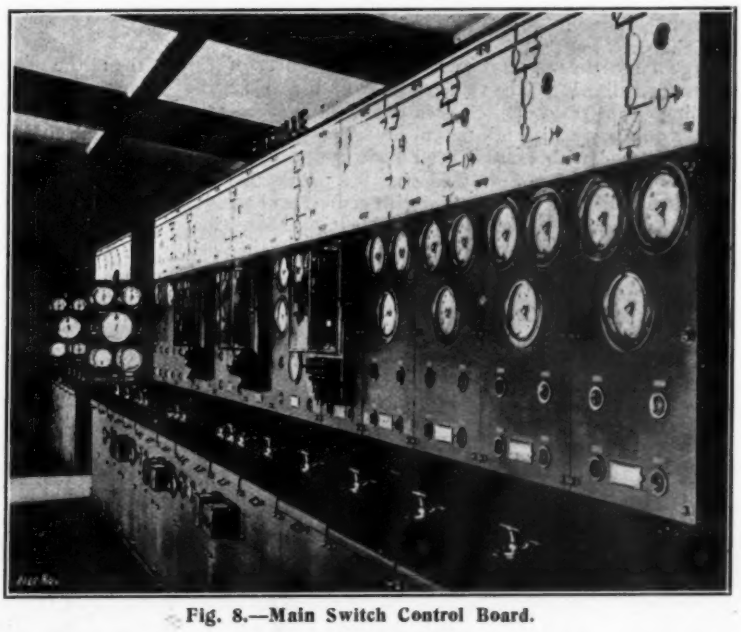


Fig. 8.—Main Switch Control Board.

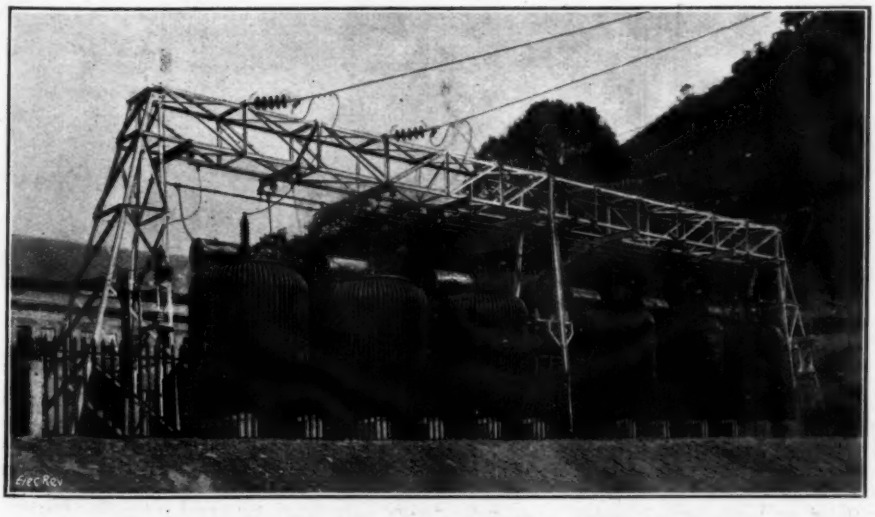


Fig. 9.—Step-up Transformers and 66-kV Line Terminal Frame.

the complete rotor was tested to an overspeed of 100 per cent. There are four nozzles per turbine, so arranged that two jets impinge on the buckets of each runner. The needles are of the solid cylindrical type, and both needle tips and nozzles are made of stainless steel. Speed control is obtained by means of deflectors and needle valves: on rejection of load taking place, the deflectors instantly divert the jets from the runners, which operation is followed by a diminution of the jets due to the gradual closing of the needles;

in the case of a 100 per cent. rejection of load, the momentary increase in speed will only be 10 per cent. To provide against a runaway, an automatic centrifugal overspeed device is incorporated in the governor pump pulley. On a predetermined overspeed being reached, a spring-loaded piston valve will trip and open a discharge from the top of the regulating valve of the governor, allowing this valve to rise and so close the turbine. The same device operates when the speed falls blow a predetermined minimum, and the spring-loaded valve is fitted with contacts which are connected to the tripping mechanism of the circuit breaker. The governor is of the evolvent type with centrifugal pendulum, the position of which at any instant determines (except in the case of overspeed or underspeed) the position of the regulating valve; through the latter oil is admitted under pressure to a differential servo motor, the supply coming from a pressure tank fed by a rotary pump that is driven by belt from the turbine main shaft. The piston of the servo motor, the position of which is controlled by the pendulum, controls the needles and deflectors through rods and levers. A hand-controlled electrically-operated speed-adjusting device is also provided; in addition, each alternator control panel is fitted with a push button for use in emergency to close down the turbine and trip the machine circuit breaker. The directly-connected alternators are of the standard low-speed, salient-pole type designed by the English Electric Co., Ltd., for a maximum output of 6,000 kW at 6,600 volts, 0.8 p.f., 50 cycles, 3-phase, 333 r.p.m., each machine having its own directly-coupled 48-kW, 110-volt exciter with overhung armature. Forced ventilation has been adopted, the air being led into a pit below the machine by tunnels, the inlet to which is controlled by hand-operated dampers; from the pit air is led to the fan inlet at either end of the machine by intake shields, the combined pressure of the fan and pole forcing most of the air through the radial ducts in the core, from which it is discharged to the chamber formed by the solid back of the frame. Part of the air is by-passed through cored holes in the ends of the frame, which serves to cover the overhanging parts of the stator end windings. Alternative means of exhausting the heated air are supplied in the form of top and bottom chimneys in the frame casting: the bottom chimney is arranged to discharge through the pit to the hot-air duct traversing the whole length of the station. Six thermo-couples per machine are embedded in the slots, being connected to a pyrometer controlled by a 12-way selector switch.

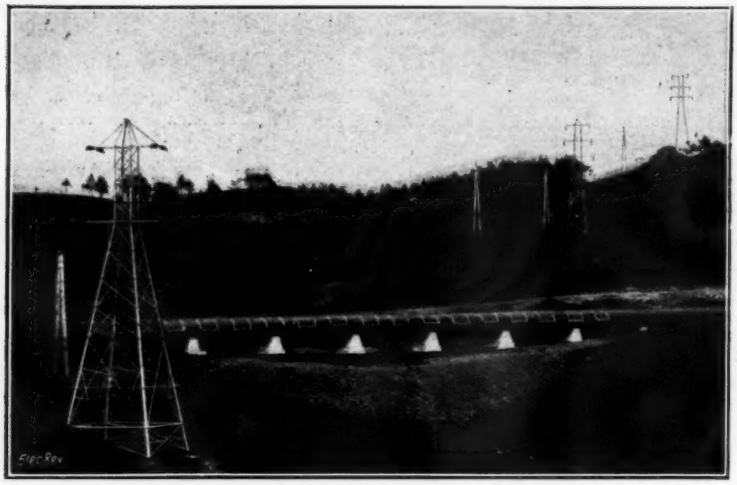


Fig. 10.—66-kV Anchor Tower and L.p. Water Conduit.

The whole of the power-house switchgear controlling the 35-kV and 6.6-kV, 3-phase power supply is of the Reyrolle metal-clad draw-out type (fig. 7). The main 10-panel, 6,600-volt bank includes three oil-immersed circuit breakers of the horizontal draw-out type for controlling the three alternators and two for the two 10,000-kVA banks of Ferranti single-phase transformers stepping up to the 66-kV transmission lines, as shown in fig. 9.

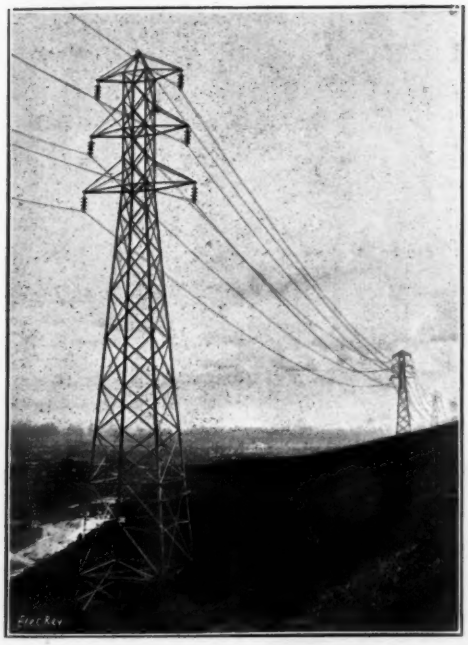


Fig. 11.—Intermediate Tower, 72 ft. 6 in. high, with 6-ft. Extension Frame.

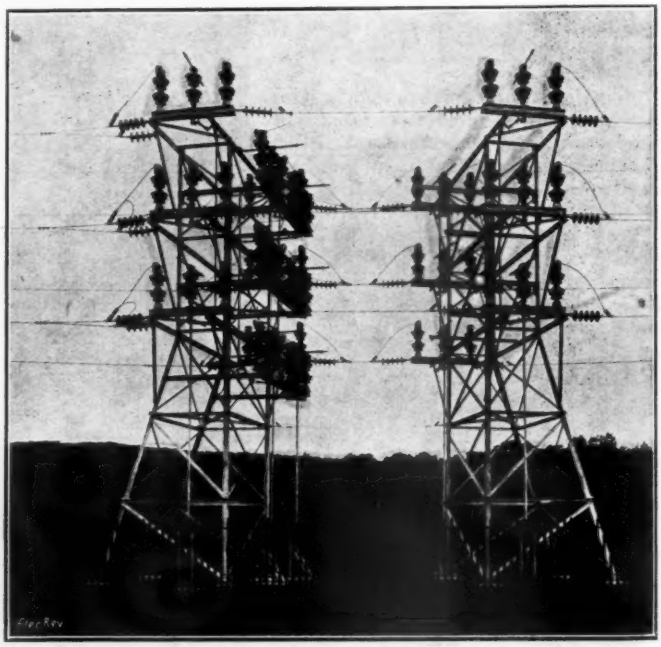


Fig. 12.—Corwen Switching Station.

(To be concluded.)

Radio Receiver Volume Control.

Some comments on the various applications of variable resistance as a means of controlling the volume of reproduction of broadcast radio-telephony.

By A. B. WHITTAKER.

ONE of the necessities which have arisen from the tendency to incorporate four, or more, amplifying stages in modern broadcast radio-telephone receivers is that of adequate volume control without introducing distortion. The means whereby such control can be best obtained is not, as many designers appear to imagine, a matter of shunting the input terminals of a low-frequency stage with some variable high resistance; the subject calls for reasonable technical understanding, as haphazard methods in this respect may quite reasonably result in "cutting off" either the upper or lower musical frequencies falling within

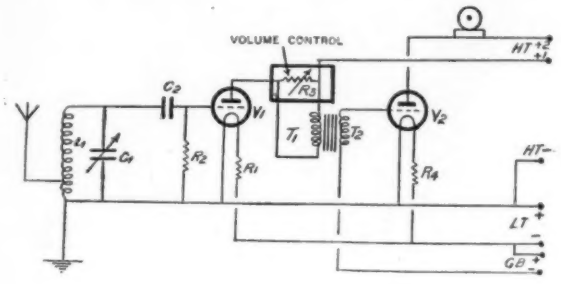


Fig. 1.

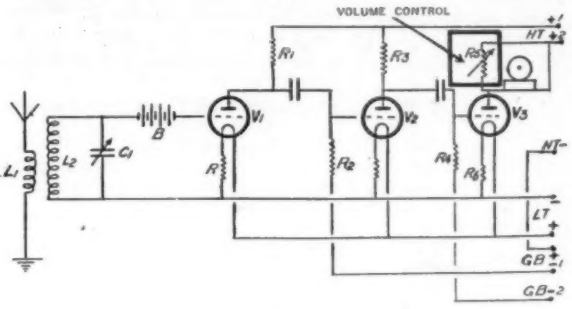


Fig. 2.

the responding range of the loud-speaker, the set, or both; it being appreciated that the entire range of musical frequencies is not at this stage of progression receivable with equal amplitude. Indeed, it is this absence of straight-line amplification that calls for special attention, and because of it particular care is necessary to avoid making the receiver even less responsive to the low and high extremities of the musical scale.

Probably one of the most generally used forms of volume control is that depicted in fig. 1, which shows a variable resistance of some 50,000 ohms connected across the primary winding of an audio-frequency transformer. Apart from the simplicity of the arrangement, this form of control for the reception of music is not of the best for the following reasons: subject to the correct procedure of matching the impedance of the

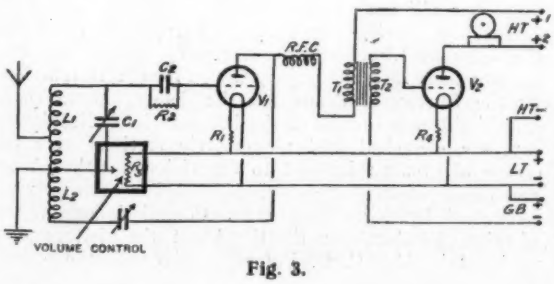


Fig. 3.

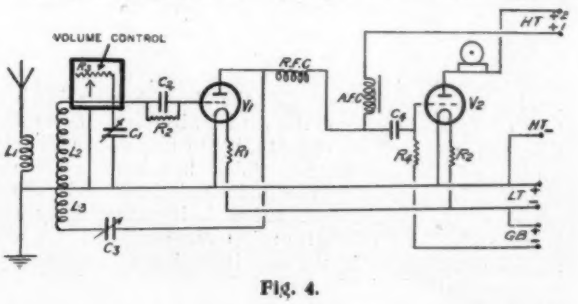


Fig. 4.

valve V_1 with that of the primary T_1, adding the resistance R_3 will, on the one hand, obviously alter the impedance of T_1; on the other hand, assuming that this has been considered, various adjustments of R_3 by way of volume control will again unbalance the impedances with the result that a certain impurity of tone will become noticeable. In the case of short-wave reception, in which the signals are in most cases telegraphic, this form of volume control is extremely useful, and its adjustment is comparatively free from hand-capacity effects.

Another simple control method is indicated in fig. 2, wherein it will be seen that a variable resistance is connected across the loud-speaker winding. Such an arrangement is very popular in America, where the variable resistance is usually incorporated in a plug for use with jack switching. A further means of control, one which is particularly useful in the reception of high-frequency signals (that is, short wave-lengths), is that illustrated in the third figure. The arrangement incorporates a potentiometer R_3, connected across the l.t. supply, the slider being connected to the earth potential end of the tuning inductance L_2. In operation it will be found that the adjustment of the potentiometer slider between the positive and negative points of its resistance coil has a marked effect upon the reaction adjustment, and in the case of short-wave receivers gives a control approaching the ideal. A fault common to practically every one of the commercially designed short-wave sets is "floppy" reaction, whether Reinartz or other types of circuit be used, and the incorporation of means of control such as that just described would be very acceptable. The method of operation is, of course, dependent upon varying the positive potential on the grid of the rectifying valve, and, since the modern valve in the case of leaky-grid rectification gives the best result with full positive potential, any slight or otherwise negative potential introduced will result in a drop in signal strength by virtue of loss of sensitivity of the valve. In this way a really broad range of volume control is obtained without introducing distortion.

Fig. 4 shows another arrangement which may be used when the first valve is used as a rectifier. It can, of course, also be used when one, or more, high-frequency valve precedes the detector, but it is not recommended for such circuits. The variable resistance R_3 can con-

veniently be one of the many variable grid leaks now procurable, and, though the range of volume control is not wide, it is nevertheless highly commendable for use in two- or three-valve circuits.

In cases of one, or more, high-frequency stages being used, probably the most efficient manner in which to obtain the desired control of volume, independent of any other adjustment, is that illustrated in fig. 5. For reasons of simplicity, only one high-frequency valve is shown, but when two, or more, such valves are used, the method to adopt is shown in fig. 6. Reverting to the former figure, R_1, is a fixed resistance of a value suitable to the valve and accumulator voltage which, in conjunction with another resistance R_3, is connected in series in the filament lead of the l.t. supply; the latter resistance is, of course, variable and should be of about 30 ohms. The purpose of R_1 is to prevent over-running the filament of V_1 by the injudicious use of R_3. This method possesses the advantage that no matter how feeble may be the signals, not at any stage of the control range is distortion brought about. The operation is merely that of dimming the filaments of the high-frequency amplifiers, the range of control being from full high-frequency sensitivity to the merest whisper.

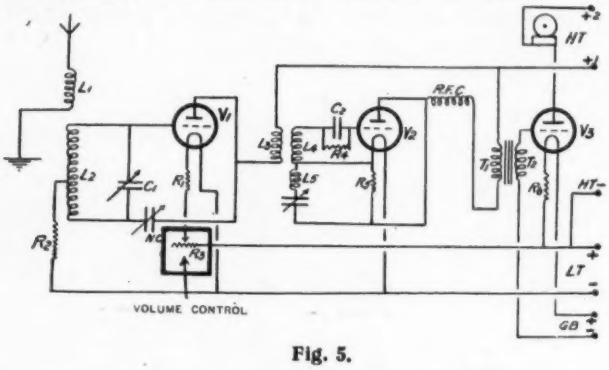


Fig. 5.

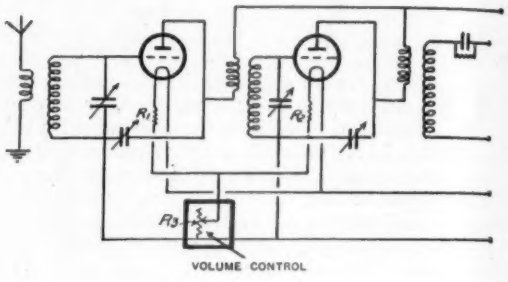


Fig. 6.

The International Illumination Congress.—III.

An Account of the Tour in the United States, and the World Congress at Saranac.

(By OUR OWN CORRESPONDENTS.)

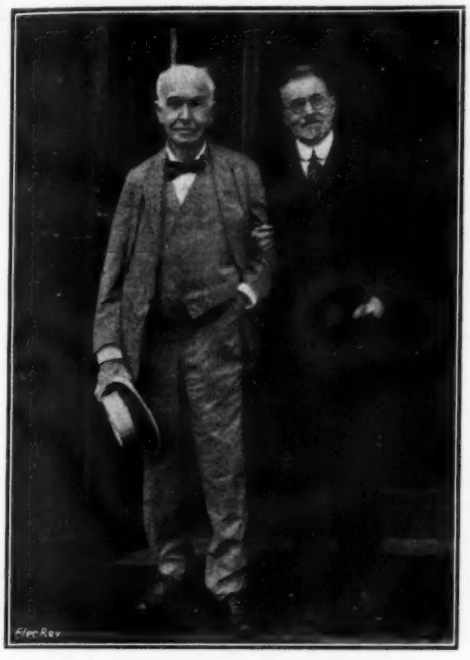
On September 7th we moved off for Boston. Overnight, silent friends had labelled our luggage, and in some mysterious fashion had transported it to the train, where we found it in our duly allotted places on arrival. At the Lynn works the General Electric Company had prepared for us a number of special demonstrations of street lighting, floodlighting, and traffic signals. The trees and shrubs in the grounds were specially illuminated for the occasion by means of coloured floodlight, and guides conducted the visitors around the demonstration laboratories. A series of model streets in which various lighting systems were shown was a very entertaining and instructive feature of the visit. On the following day, September 8th, visits were made to the Charles Edgar generating station, which has a total capacity of 133,150 kW, the Massachusetts Institute of Technology, and Harvard University. Several delegates also took an opportunity to inspect the First Church of Christ Scientist, which has a remarkable lighting installation. The principal feature is the dome, 90 ft. in diameter, which is illuminated by a battery of 156 250-watt projectors, concealed on a special construction in the roof in such a manner that they are quite invisible from below. Prior to leaving Boston for our next stage, we were entertained at dinner at the Brookline Country Club.

On Sunday, September 9th, after a night in the train, we arrived in Philadelphia. Most of the day was spent in visiting places of interest, and in the evening we were taken to Franklin Square to inspect the floodlighting of the tower on the new building of the Electric Co. This is a truly remarkable installation, consisting of 480 projectors having a total connected load of 263 kW. Sections of the projectors are fitted with coloured screens, and these remain permanently in circuit. The remainder, which have clear glass covers, are connected to dimmers, motor driven. The gradual fading out of the colours in an irregular sequence gives an impression of beautiful harmony and splendour.

Before leaving Philadelphia we had an opportunity of inspecting the new and remarkable lighting installation in the Museum of Art. Although in the principal rooms no natural light is available, it is difficult to realise the fact, due to the skill with which the designers have employed electric "daylight" lamps and concealed them behind dummy windows. This unique installation is worthy of detailed description, but space will not permit of it.

Our host during our short stay in Washington was the Potomac Electric Power Company, which had prepared a most interesting programme for our instruction. At the Bureau of Standards the delegation was conducted through several of the laboratories. Needless to say, the electrical and photometric sections were the centre of greatest interest to the visitors, although no new developments were observed. At luncheon we were addressed by Mr. Dougherty, Commissioner of the district of Columbia; the thanks of the visitors were tendered by Mr. C. C. Paterson, who took the opportunity whilst in the Capital to express appreciation for the many courtesies and extreme hospitality which we had received throughout the tour. After luncheon we made a hurried trip to the house of George Washington, and afterwards to the tomb of America's unknown soldier. There, with due solemnity, the whole of the visiting delegates formed up whilst Mr. C. C. Paterson on their behalf placed a wreath on the tomb. In the evening we were taken on an inspection trip of the principal lighting installations, which included the floodlighting of the Capitol and the Lincoln Memorial.

We arrived in Cleveland at mid-day on September 11th, and after three successive nights in the train, were much relieved to arrive at our hotel with the prospect of a real bed in view. Of all the cities so far visited, it can safely be stated that Cleveland is the most progressive in



Mr. Thos. A. Edison and Mr. John W. Lieb.

respect of electric lighting. This is, no doubt, largely due to the enterprise of the supply undertaking, the very virile Electrical League, and the influence of the Illuminating Engineers of Nela Park.

From the observation tower of the new Union Terminal Tower, whose 52 stories reach a height of 708 feet, one obtains a remarkable impression of the city's brilliance. The high level of street lighting, the signs and the illuminated poster boards, and the beautiful floodlighting installations are an inspiring sight. The Union Tower floodlighting installation is one of the finest in the country; it is lighted by 240 projectors located in the cornices and recesses, and the total connected load is 136 kW. The watts per sq. foot of surface illuminated averages 4, and the intensity measured on the frontage is about 20 foot-candles. A similar floodlighting installation of note is the Ohio Bell Telephone Building, which has 186 500-watt projectors, providing an average illumination of 10 foot-candles. Most of the main business streets are illuminated by means of upright diffusing globes of the pole-top type. Superior Avenue employs this system using 25,000-lumen lamps on 100-ft. opposite spacing. A remarkable lighting installation was inspected in the Cleveland Public Auditorium. This building will accommodate 15,000 people, and is covered by an immense glass sub-skylight. No natural light enters the building, so special care was taken in the design of the electric lighting system; this consists mainly of lighting through the glass roof by means of 320 750-watt lamps in silvered glass reflectors, supplemented by 630 200-watt lamps in similar reflectors concealed in the large cornice. The lighting units are equipped with colour screens, enabling a number of changes to be made to suit the variety of occasions for which the hall is employed—from theatrical productions to motor shows. The delegates also had an opportunity of inspecting the well-lighted factory of the Leece-Neville Company. This is equipped with large gasfilled lamps in enclosing reflector units, giving an intensity of from 12 to 18 foot-candles.

On September 12th we visited Nela Park, the technical and administrative headquarters of the National Lamp Works of the General Electric Company, when we were received by Mr. Geo. Kewley, Mr. S. E. Doane, and Mr. M. L. Sloan, who, in a brief speech of welcome, introduced Doctor Charles Eaton, head of the industrial relations department of the Company. Nela Park has been well named a "University of Light" and our visit to this remarkable organisation was much too rushed. Although our hosts had arranged a time schedule, it was found to be impossible to keep to it, owing to the desire of the delegates to make a closer inspection of the many lighting demonstrations which were available. The Nela School of Lighting situated in the basement of the engineering building is replete with every lighting demonstration that can be imagined, from a grain-of-wheat lamp used for medical purposes, to a 50-kW lamp used for the illumination of aviation fields. Dr. Luckiesh conducted us over his research laboratory, and gave us details of his work in the physiological and psychological aspects of illumination. In the lamp development laboratory we were given a "peep behind the scenes" at the latest machines for the manufacture of lamps. It is here that these almost human mechanisms are developed and tested before being put into regular service in the factories. Luncheon gave Mr. W. E. Bush, on behalf of the visitors, an opportunity to express appreciation of the pioneer work which Nela Park has carried out in the realm of artificial lighting and thanks for their co-operation and hospitality.

The Delegation at the Bureau of Standards, Washington.

Heat Dissipation in Cables.

An investigation into methods for improving the power-transmitting capacity and reducing the cost of underground cables.

By MAJOR A. M. TAYLOR, M.I.E.E., Mem.Am.I.E.E.

IT has been shown in a previous article (Electrical Review, August 17th, 1928) that by the use of "intersheaths" a cable may have its internal thermal resistance so reduced that it is given a 40 per cent. thermal advantage over a plain single-core 132,000-volt cable, as well as a 45 per cent. voltage advantage; the two cables chosen for comparison being of practically identical diameter, voltage gradient, and internal temperature drop.

In each case, a single single-core cable, far removed from all other cables, was considered. Consequently the external temperature drop, or "ground drop," did not enter into the question. This enabled a simple comparison to be made without introducing side issues.

It is now proposed to consider the question of how to improve the power-transmitting capacity by a further reduction of the temperature of the innermost core; and in order to do this it is necessary to consider the question of the total temperature drop (*i.e.*, "internal" plus "external"); and how the output of each type of cable (intersheath and non-intersheath) can be increased for a given total temperature drop, which we will fix at 35 deg. C., with a "base" temperature of 15 deg. C.

It may be premised that the gains in the "ground drop" considered in the present article apply equally to both intersheath and non-intersheath cables; but the "internal" gains favour the "intersheath" cable somewhat.

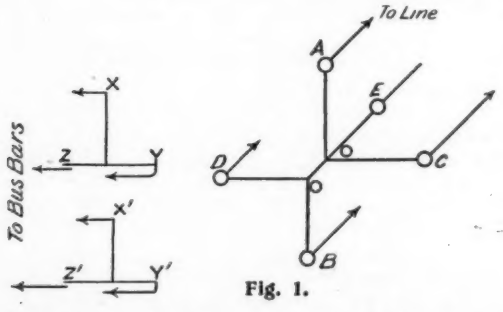


Fig. 1.

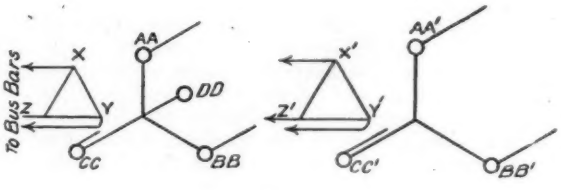


Fig. 2.

Data Available.

From the earlier article we have:—

Single-Core Cable:—

At 90,800 kW the (single-phase) loss (excluding lead sheath and dielectric losses) per cm. length of cable is ... ... 0.199 Joule.

The internal "drop" (thermal) is ... 19 deg. C.

Intersheath Cable:—

At 144,000 kW (3-phase operation) the loss per cm is ... ... 0.336 Joule.

The internal "drop" (thermal) is (appr.) 19 deg. C.

Conditions of Operation Considered.

In all that follows, it will be understood that, owing to the high voltages, independent (single-phase) cables only are considered; as the diameters are quite too large to permit of the three cables being wormed together as in the "S-L" and "Höchstädter" types.

It is, of course, well known that the three cables composing the three phases must be brought together as closely as ever possible, so as to eliminate lead-sheath losses. This involves their treatment, from the ground-temperature-drop point of view, as though the total heat losses of the three cables were all concentrated at one point, and increases the thermal "ground" drop accordingly.

Where there are only two cables (as will be introduced later), cognisance is taken of the fact that the "surface resistance," due to the "gathering" of the lines of heat flow, will be rather higher than where there are three cables.

An investigation of the relative "surface resistances" for the three cases of:—

(*a*) Three cables; all closely contiguous.

(*b*) Two cables; both closely contiguous.

(*c*) One cable; all by itself.

is undertaken later in this article.

It is accepted that, within the area of towns, it is desirable that magnetic fields produced by the operating currents should be cancelled out, and therefore that the cables must either be normally arranged in groups of three or, if 4-phase working be adopted, in groups of two.

It is also assumed that, in the open country—*i.e.*, in the transmission of power over long distances—the non-cancellation of magnetic fields will be permissible, provided that arrangements are made whereby the currents in the lead sheaths can be checked.

With these considerations before us, we are brought to a point where the obvious temptation to resort to 4-phase working (in order to reduce "ground drops") must be very firmly resisted, *unless* it can be shown conclusively that 4-phase working is not throwing away as much money in extra cables as it is gaining by increasing the possible output per cable.

In the investigation that follows, the author does not wish to be understood as implying that 4-phase (or even "quarter-phase") transmission is a panacea for all cases. He only recommends it for certain cases of "straight-through" transmission, where the *supreme importance* of freedom from any interruption of, or even interference with, the transmission, even for a moment, counts above everything else; as well as where the power to be transmitted through a single cable is above the economical capacity of present ((33,000-volt) cables.

He also recommends it where the reduction of expenditure on cables (he hopes to show a *reduction* of 70-75 per cent., as compared with 33,000-volt cables) warrants the employment of the highest voltages, and of any other expedient (*e.g.*, "intersheaths") which will conduce to that end.

4-phase v. 3-phase Working.

The advantages which the author wishes to put forward for 4-phase transmission are only realisable if it be first conceded that, for the particular case under

consideration, a single 3-phase transmission (see fig. 2, p. 706) consisting of 3 single-phase cables (AA, BB, CC) supplemented by a fourth cable (DD), is unsatisfactory, as not giving sufficient reliability and that a second system (AA′, BB′, CC′) is necessary.

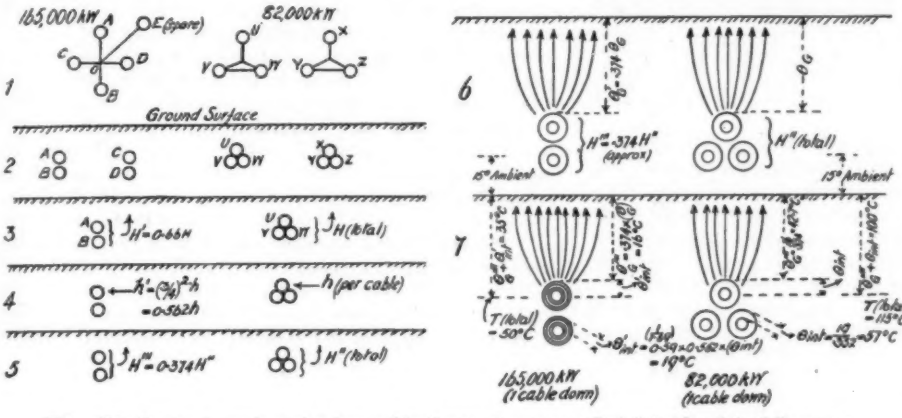
That it is unsatisfactory, where *absolute continuity* of supply is essential, should a cable break down, must, he thinks, be conceded; because the supply must be interrupted while:—

(1) It is being determined which cable is the faulty one—this sometimes taking a little time (if the fault does not immediately develop into a "short").

(2) The necessary "selective" connections are made through isolating switches, between the spare cable "DD" (see fig. 2) and the "empty" phase of the transformer.

(3) The disconnection of all synchronous apparatus from the circuit is performed.

(4) The paralleling is done of the two ends of the line if there is a generator at the sub-station end—a normal condition where there is a long-distance transmission.



Note. This diagram is purely explanatory andthe figures given are not final, but only substantially correct.

Fig. 3.

All this might take between 3 minutes and half an hour. Any engineer who has known the anxiety of being responsible for the supply of a city requiring, say, 100,000 kW, whose principal generating station is outside the city, and whose only link with the city is through super-tension cables some of which have shown signs of weakness will, the author thinks, have no difficulty in persuading his committee to decide for the supply which gives him the greater security—particularly if it costs very much *less* in capital outlay and maintenance.

(It will be understood that, at the moment, we are not considering overhead transmission; the question before us is simply whether the proposals about to be made do, or do not, give a reliability comparable with that of a "twin" 3-phase underground transmission.)

Transmissions of 80,000 kW are Contemplated.

When we are considering transmissions of over 80,000 kW, the position is further decided by the fact that it is quite impracticable, under present methods of transmission, to put much more than 80,000 kW through a single transmission (AA, BB, CC) see fig. 2—with a cable not exceeding 3 in. under the lead sheath, even if we employ 132,000 volts.*

Whereas, it will be demonstrated that it is possible, by means of a 4-phase "intersheath" transmission (see fig. 1, p. 706) to raise the power to, in certain cases. 195,000 kW (or, by a 4-phase "non-intersheath," to raise it to 133,000 kilowatts), *and yet to have two complete and distinct transmissions*, with a spare super-tension cable common to both.

It is, of course, recognised that, in short-distance transmissions, the 195,000 kW *might* be transmitted by means of 33,000-volt cables; but Mr. J. S. Highfield and others (including the author), have pointed out the tremendous congestion of cables involved in so doing; and the fact remains that not only is the congestion serious, and the capital outlay also, but that at the lower voltages *we are defeating our own ends* (so far as the keeping of the cables cool is concerned) by liberating a much greater total amount of heat in the ground than we need do; and, consequently, "reduction factors" have to be introduced in our calculations, greatly reducing the current each cable will carry.

* Cables above 3 in. in diameter are not suitable for use in ducts.

Long-distance Transmissions.

On longer-distance transmissions, the efficiency of transmission, as well as the regulation, is materially interfered with by the employment of too low a voltage; and though the latter defect can be overcome by using induction regulators, or transformer tappings, yet this is not effected without a further capital outlay and a slight loss of efficiency.

As, however, the present article is, in its general aspects, considering more particularly the reduction of underground cable costs in *long-distance* transmission, with a view to offering a direct challenge to overhead cables, all the above remarks tend, of course, to emphasise the importance of increased means of heat dissipation, increased security of supply and increased voltage; because the overhead system (where carried out on the "ring-main" principle) offers a very high degree of security at a low cost, combined with a very high efficiency.

For foreign countries, where water power is plentiful and the distances are great, the necessity for reliability of supply and for the highest voltage becomes still more accentuated; and this again works out in favour of 4-phase transmission and of "intersheath" cables, if underground cables are to have a fair chance as against overhead transmission.

The author suggests, therefore, that where reliability of supply, coupled with low prime cost and high efficiency, is the governing consideration, he has demonstrated that a 4-phase system—*provided* that it will give the increased cable outputs suggested—is well worthy of consideration; even though it involve a return to tee-connected transformers. (Incidentally, there will be quite an appreciable saving on switchgear and transformers).

It now remains to show how this increased output can be obtained.

Details of the Steps by which the required Heat-dissipation may be Obtained, without exceeding a Total Drop (Internal plus External) of 35° C.

Fig. 3 (above) gives a simple pictorial representation of the stages of thought requiring consideration. Let the cables A, B, C, D, U, V, W, X, Y, Z, be all identical single-core cables; and let it be assumed that a complete 3-phase system, in parallel with the first (*i.e.*, six cables in all) is necessary (this point has been already demonstrated in this article) and that, on the occasion of a fault in any one of the six cables U, V, W, X, Y, Z, the second transmission is, for the time being, cut out of commission; and that it may be three or four days, or longer, before the faulty cable is again ready for regular operation.

We have therefore to consider that an equal load has to be carried by the single system U, V, W, as has to be carried by A, B, C, D.

A spare cable (E) is shown, the object of which (see fig. 1) is to enable the 4-phase system to be looked upon *as two separate and distinct, "quarter-phase" systems, to which* (E) *forms the common "return."* Obviously, therefore, the failure of, say, cable (B), can be caused to instantaneously cut off the lower primary (X′, Y′, Z′), when the out-of-balance current immediately returns through (E). (Or, alternatively, A, D, C, may all three be left in circuit and the out-of-balance current be allowed to return *via* "A" and "C"). A low-tension neutral may now be substituted for the high-tension neutral and the latter, at leisure, be put into the position of the faulty cable.

Referring now to sub-diagram (2) of fig. 3, which considers the aspect of the cables as underground heat distributors, it is obvious that we can put "A" and "B" together and—some distance away from them—"C" and "D" also together.

Sub-diagram (3) shows that, considering *equal* powers transmitted per cable by 3-phase as with 4-phase, the total heat (H′) of (A) and (B) together is only 66 per cent. of that of (U, V, W).

But this would transmit $1\frac{1}{2}$ times too much power *via* (A, B, C, D). Hence, the current per cable in (A) and (B) (see sub-diagram (4), may be reduced to $\frac{2}{3}$ of that in (X, Y, Z).

Combining (3) and (4) we get sub-diagram (5); and endeavouring pictorially to represent the thermal drop in the ground (θ_G) we get sub-diagram (6); in which the result of a subsequent investigation as to the slightly-increased thermal "surface-resistance" of the left-hand arrangement is, however, not taken cognisance of.

Lastly, in sub-diagram (7) the substitution of "intersheath" cables (indicated by the three concentric circles) is considered; embodying also the results for "*internal*" thermal drop obtained in the article in the Electrical Review for August 17th, 1928 (the multiplier 1.70 being here shown, however, as 1.69).

The result is that, in order to save the cable from reaching the alarming temperature of 115 deg. C., the output of the 3-phase transmission has to be cut down to 82,000 kilowatts, corresponding to the case in which the 4-phase power is 165,000 kilowatts. (The latter is the case referred to in *Table "A"* (to follow) as "Town" working. It is impossible in this article to give details as to how this result is effected, but the data given permit the calculations to be checked.)

The proof of this (approximately) is really contained in the figures given in the diagram fig. 3, but as the comparative results are given in detail elsewhere in this article, and in a form in which they are more immediately useful, it is not considered necessary to explain in further detail how the 115 deg. is arrived at. The fig. 3 is merely an attempt to present to the less technical reader the general principle involved.

When we come to transmission in the open country, where the four cables, A, B, C, D, may be spread out so as to get the full heat-dissipative advantage, the output may be increased to 195,000 kilowatts. (The details of the method by which this is done cannot be dealt with in the present article; but here, again, the data given permit the calculations to be checked.)

It should be explained that, down as far as sub-diagram (6), *only* the drop in the ground is considered. Consequently in sub-diagram (7), which takes into account not only the "external," or "ground" drop, but also the "*internal*" drop, we are at liberty to *repeat* the saving indicated in sub-diagram (4), since obviously, if we have only 56 per cent. of the heat generated in the copper, this affects both the internal *and* external drops equally, and this is the reason of the factor (0.562) being introduced in the extreme bottom calculation of sub-diagram (7), where (θ'_{int}) signifies the internal drop of the intersheath cable, while (θ''''_G) signifies the external, or "ground" drop

(*To be concluded.*)

Trade Prospects in Palestine.

The author, who was until recently electrical and mechanical engineer in the Public Works Department of the Palestine Government, deals with past and prospective electrical developments in the Holy Land, and directs attention to the openings for manufacturers of electrical goods and machinery.

By C. H. DOBELL, A.M.I.Mech.E.

WHEN considering the prospects of British engineers, engineering firms, and manufacturers in Palestine, it should be remembered that the country is divided geographically into three distinct tracts of land, each in need of machinery of different types. First, there are the low-lying, fertile plains extending from the sea inland, then the Judean Hills, which are of a more or less barren nature, falling on the other side to the Jordan Valley, which is considerably below sea level and tropical. The fertile plains can be very productive, and a large trade can be developed in oranges, grapes, wines, and agricultural products. The chief towns are Jaffa (with which is included Tel Aviv, the chief Jewish colony), and Haifa, where electricity has already been installed by the Jaffa Electric Company and the Palestine Electric Corporation, respectively, under the Rutenberg concession. The supply is in both cases at 380/220 V, 3-phase, 50 cycles, distribution being by overhead networks from transformer stations, which are supplied from Diesel stations at 6,600 V by underground cables. High-pressure overhead lines at that voltage are run from Jaffa to Petach Tikvah, Sarafand, Rishon Le Zion (noted for its wines), and Nes Ziona, which tap the greater portion of the orange-growing country, and pole transformers are installed to meet the demands of orange growers *en route* for pumping and lighting.

The present price of electricity for lighting is 1s. per kWh, and for power 6d. per kWh; special tariffs, however, are arranged for bulk supplies. These prices come up for revision in two years' time, and will be considerably reduced, one imagines, when the Palestine Electric Corporation has completed its hydro-electric station on the River Jordan.

The needs of this section of the country are pumping plants, electrical supplies, and ice plants. Deep-well boring plants are also in demand. The inhabitants are only too willing to purchase British goods, but find that greater facilities are given by Continental firms, especially in the matter of longer credits. Consequently, if one searches Jaffa, which is the chief commercial town at present, for example, for high-class cable for house installations, &c., only Continental material will be found, as traders say they can only procure British goods by cash or proof of a definite order. The same is found when attempting to obtain oil engines, motor-cycles, or cars

During the last few years factories for the manufacture of chocolate, silk, silicate, bricks, and cigarettes, to name only a few of the industries which the population is attempting to inaugurate, have been erected in Jaffa, and Haifa has factories for the manufacture of a high-class Portland cement, oil and soap, tobacco, and flour There are good engineering works of a general nature in both Jaffa and Haifa. The Imperial Airways have a station at Gaza, on the Cairo-Bagdad route.

Business could be done if a properly-organised attack were made to secure the trade in raw materials for these industries. Agricultural machinery will be needed in the near future, as the Jewish colonist's work on the land progresses, much of which will be electrically driven when the Rutenberg undertakings have extended their lines over this part of the country Manufacturers would do well to inquire into this possibility before the market is seized by Continental firms.

The climate of this track of land is similar to all the Mediterranean coast. The Judean Hills zone, in which Jerusalem is the most important town, has very little in the way of industry, but a fair amount of quarrying is going on. Electricity is on the way to being installed in Jerusalem and surrounding neighbourhood, but has been delayed owing to the city's being outside the Rutenberg concession, while considerable difficulty has been met in progressing with a separate concession. Now, it is understood, this has been overcome, and Jerusalem may be expected to have its electricity supply within the next year or two. There are several small but reliable engineering firms who are willing to take up British agencies, the needs being stone crushers, oil engines, electrical supplies, possibly ice plants, motor-cycles and motor-cars.

The Jordan Valley has very little at present to put on the market; oranges, plantains, and bananas are grown at Jericho, and other fruits, as grapes, in the neighbourhood of the river. An irrigation scheme is on foot, on completion of which the valley should become very fertile, with a possible market for electrically-driven agricultural machinery and pumping plants. The mineral wealth of the Dead Sea is about to be exploited, which may mean the construction of a railway or aerial ropeway to Beisan, which is already connected with Haifa, to deliver the goods, or a further chance for a transport company by road to Jerusalem. No restrictions are placed on the import of machinery. The country has not many engineers, but reliable agents could be found to sell British goods, especially if manufacturers were prepared to help them as much as possible financially. Labour is plentiful, but a great difference exists between Jew and Arab in price. Mechanics are to be found among Jews, Greeks, Armenians, and also among the Arabs, the rates demanded being from £9 to £20 per month, and labourers at rates amounting to £4 or £5 per month. For Englishmen the cost of living is high; it is impossible to live comfortably, except for a single man, on a salary under £500 a year, and then only on a small scale. Housing is not a problem, but, judged by European standards, rents are very high.

Great hopes are held for the country's future, but the industries of the place need money; before it can become a large market for British goods, or a land of milk and honey for the British engineer, much must be done to give the struggling population every financial facility to procure the goods which it needs. Representatives of British firms, with an extension of only a few days on their scheduled time, when in Egypt, can thoroughly examine the possibilities of this mandated country.

The Government, presumably, is the greatest importer of machinery, but this, together with spare parts and raw material, unfortunately for engineering firms and agents on the spot, is practically all purchased through the Crown Agents for the Colonies. One cannot help feeling that it would be better for the country and possibly cheaper for the Government if local traders were allowed a larger share of this trade; in fact, one would think that a mandated country could demand it.

There are one or two public works contractors with whom business might be done with the usual contractor's plant; for example, there is not a great deal of pneumatic machinery in the country, and it therefore might reasonably be expected to be taken up by contractors and municipalities.

With regard to electrical supplies, the immediate demand is for small motors, fans, wire and cable, table lamps and fittings, and meters; comparatively little progress has been made with domestic appliances for cooking and heating. The first electric lift has been installed, with possibly more to follow, and kinemas are on the increase.

Large works are contemplated, including the construction of a harbour at Haifa, water supply and drainage for Jerusalem, and in the future, it is hoped, a pipe line and railway from Irak.

It is hoped that these notes may be a preliminary guide to anyone seeking a market for his goods or contemplating the carrying-out of engineering works in Palestine.

Showroom Problems.

The First E.D.A. Salesmanship Conference of the Season.

THE first conference of the 1928-29 session organised by the E.D.A. was held at the Royal Society of Arts on October 19th, and the hall was overcrowded. Mr. C. H. Cox (Edison Swan Electric Co., Ltd.) was in the chair, and the speaker for the evening was Mr. W. Millner, of the Westminster Electric Supply Corporation, Ltd., who dealt with the subject of organising for better selling in electrical showrooms.

Mr. Millner said that the first question was: "What is the best type of showroom and where should it be situated?" There existed many large and ornate showrooms, and at the other extreme there were showrooms which were, so to speak, put away in a corner of the supply station. The ideal lay between the two, and he was doubtful whether the expenditure on very large special buildings was justified. The planning of an electrical showroom should not be left entirely to the architect; the main outline should be designed by a competent engineer with selling experience. The chief thing to aim at was the correct atmosphere with adequate facilities for demonstrations. Sufficient space should be allowed for the effective display of quick-selling articles such as lamps, shades, novelties, &c., and definite treatment should be given to such articles as electric fires. Dummy fireplaces were not costly to construct, and they made a vast difference to the effectiveness of the display. There should be a dining room, bedroom, bathroom and model kitchen, whilst in industrial areas applications of electric power should be demonstrated.

Showrooms should be centrally situated. It was false economy to select a situation off the main street because of a lower rental. In districts where one authority supplied over a wide area it was better to decentralise the showrooms rather than to concentrate everything at headquarters. There should, however, be one showroom in the most important district, larger or more fully equipped than the others, to which customers or prospective customers could be taken for more complete demonstrations than were possible in the smaller establishments.

One of the most important matters was the wiring installation, and an ideal to be aimed at was the provision of a supply of electrical energy within 6 ft. of wherever a demonstrator might be standing at any position in the showroom. Nothing more impressed the lay mind than to see the facility with which apparatus could be connected casually to outlets close at hand, because it denoted flexibility and convenience. The wiring should be arranged not only for immediate use but for the future so that drastic alterations could be carried out in the general showroom lay-out without alteration to the

wiring. It was the duty of the electrical showroom to set the pace for window lighting and display in the district in which it was situated. The windows of an electrical showroom should have at least two rows of closely spaced concealed reflectors with provision for fixing colour screens. Points should be allowed for window flood lights and spot lights on the ceiling and floor. Footlights should be available and sockets should be fitted round the sides and back of the window and floor. All points in the window should be separately switched, and the switches should be grouped together in a convenient place. Motor driven flashing devices were often desirable. All showrooms dealing with electricity should have daylight wholly or partially excluded; it was impossible to demonstrate either lighting equipment or fires to the best advantage in daylight. Care should be exercised in selecting the staff and the stock. The showroom should never be overcrowded. Wherever possible, consumers should be supplied with the actual showroom models and fresh stock put in its place. A new showroom would always attract some visitors by its novelty, but it was necessary to sustain interest. The best and perhaps only way of doing that was to feature quick-selling lines which were in universal demand. Circularising could also usefully be employed, descriptions and prices of special articles being sent to all consumers in the district. The local Press should also be made use of, and demonstrations should be held as frequently as possible.

In conclusion, Mr. Millner said that there were still some supply authorities without showrooms, but the number was being gradually reduced. The electrical industry had only itself to blame if a large proportion of the domestic apparatus sold found its way to the public through the stores, ironmongers, &c. The supply of electrical energy was not a complete service in itself. In opening a showroom they were opening a propaganda department, an inquiry bureau, a service department and an instrument for ensuring better relationship with the consumer and the public.

Discussion.

In the subsequent discussion a number of somewhat irrelevant matters were raised, and the following report deals with those points which had a direct bearing on the subject of the paper.

Mr. H. Rogers (West Ham) said that it was necessary to have conveniently arranged entrance doors to a showroom. He also recommended that the whole floor of the showroom should be flat; he mentioned the case of one showroom which was on four different levels.

Mr. L. G. Buckell (G.E.C.) suggested that there should be means available in all showrooms by which the consumers would be able to compare different types of lamps. He doubted whether the best method of showing electric fires was to place them in dummy fireplaces, and suggested that the development of electric heating and cooking had been kept back because of the habit of making the apparatus as nearly as possible similar to the coal fire.

Mr. Brown (Ilford) said that ornate and even expensive showrooms were justified because any large business should be suitably housed. He also advocated two showroom windows so that two different displays could be given simultaneously. Further, a showroom should not be one long room, but should be broken up so that people could not see everything at one glance. He did not agree with the exclusion of all daylight, because sometimes daylight could be used very successfully as a contrast. Finally, he suggested some means by which window and other displays might be exchanged between the various districts, so long as the districts were not too close together.

Mr. Dain (Leyton) said it was of no use to have showrooms unless the supply undertaking was able to back up the work done. He had been associated with four undertakings in which, when consumers were obtained, it was found that there was not a sufficient stock of meters, and the consumers were kept waiting.

Mr. W. A. Gillott asked for suggestions as to how contractors could keep in close contact with the public. In the case of municipalities they could ask the consumers to pay their accounts at the showroom and they could put notices on the rate demand notes, and so on.

Mr. F. H. Howell remarked that if an undertaking had the pluck to build an expensive showroom it should have the pluck to engage a sufficient staff to be always at work outside bringing in the consumers.

Mr. Morris considered that contractors who kept efficient showrooms should be given special terms for supply for lighting purposes. Also some preferential discount should be given on sales of apparatus because the usual discount was not sufficient. It cost 15 per cent. to sell a radiator, and the contractor could not live on the balance.

Major Leith strongly urged that subdued lighting, so often seen in showrooms, should give way to plenty of light which, he claimed, made people feel like buying. The question of discounts was a difficult one. If more discount was allowed the price would have to be raised to the consumer.

A number of others took part in the discussion, and among the points raised was the high charges in many places for hiring out apparatus.

Lt.-Col. W. A. Vignoles (director E.D.A.) promised to go into the suggestion that window displays should be exchanged, and hoped something would be done in that direction. One of the great handicaps of the average showroom, he said, was the comparatively few articles that could be shown, and he thought the contractor had an advantage in that he could attract people in by showing radio and other electrical apparatus. A great deal could be done by judicious advertising.

Mr. Millner, in the course of his reply, said that he had purposely left out of the paper the question of sale or return of apparatus. He doubted whether the average window display could easily be transported from place to place, because most of his own were made up of beaver board and crêpe paper, and were pulled to pieces and made up into something else. The number of outside representatives could be overdone, but more might be done in the way of attracting the public by other means. The Americans sent round lorries with displays of electrical apparatus, for instance. There were many supply authorities who were offering apparatus on hire-purchase terms at very reasonable rates. In his own case only 2½ per cent. on the cost was charged.

Legal.

Scammell & Nephew v. Attlee and others.

The opening of this appeal in the Court of Appeal was reported in our last issue (p. 690). It relates to the stoppage of the supply of electricity to the plaintiffs' works during the general strike of 1926, for which Major C. R. Attlee and other members of the Stepney Electricity Committee were held responsible, Mr. Justice Avory awarding damages against them.

Sir W. Macnaghten, K.C., continued his address on behalf of the appellants on October 17th. Having read the evidence given at the trial and the summing up of Mr. Justice Avory, he contended there was no evidence against any of the appellants of conspiracy or of intent by them to injure the plaintiffs fit to be left to the jury. He also contended that the judge had misdirected the jury by not instructing it that the persons responsible for the supply of electricity were not the Committee but the Borough Council.

Mr. Hull, following Sir M. Macnaghten, referred to the suggestion made by Lord Justice Scrutton during the arguments that the Borough Council had allowed the Electricity Committee to act in the matter without reference to it. His (counsel's) answer to that was that the Corporation could not delegate its duty to the Committee. The duty of the individual members of the Committee was to be faithful and honest in the discharge of their duties, and the only statutory duty was on the Corporation.

At the close of the arguments for the appellants, Sir Walter Greaves Lord, K.C., supported the verdict and judgment on behalf of the respondents. He contended there was ample evidence that Major Attlee and the members of the Committee knew that the agreement they were making was the agreement those responsible for the general strike wanted. Nowhere was there any evidence of any attempt by the defendants to carry out the statutory obligations of the Corporation.

Lord Justice Greer pointed out that the evidence of Major Attlee and of one of the respondents' witnesses was that in the first instance Major Attlee tried to persuade the men not to strike. It was only when the trade unions would not agree that he consented in order to get lighting that the power should be cut off.

Sir Walter said that the appellants made no attempt to get outside help, though they knew that naval ratings were available to man the power station. The Stepney electricity supply was the only one in the London area that failed, with the exception of Fulham, where there was a stoppage for an hour. It could not be said that there was not evidence on which a jury might find the defendants were actively agreeing and helping to assist those who were carrying on the general strike.

Sir W. Macnaghten replied, and at the conclusion of the arguments, on October 22nd, the court reserved judgment.

Lektophone Corporation, Ltd., v. S. G. Brown, Ltd.

This action and counter-claim were mentioned to Mr. Justice Tomlin in the Chancery Division on October 18th by Mr. Drew, who asked that they be not heard before December 4th. He said that Mr. S. G. Brown, managing director of the defendant company, was abroad, and Mr. Swinburne, a consulting engineer and expert witness, was in America and had been unable to complete certain experiments.

His Lordship granted the application.

Lissen, Ltd., v. Harley & Harley.

In the Chancery Division on October 16th, before Mr. Justice Clauson, Lissen, Ltd., makers of radio apparatus, moved for an injunction restraining Harley & Harley, of Shacklewell Lane, Dalston, from infringing their trade-mark "Lissen" in connection with h.t. batteries.

Mr. Burrell, for the plaintiffs, said that for some years his clients had made h.t. batteries under their trade mark, and

recently they found that the defendant firm, which was really a one-man concern, consisting of Mr. E. S. Harley, had been selling the same kind of batteries under the name "Lissenon," together with the words "Appreciably improves loud-speaker tone," which differed only from the plaintiff company's slogan by substituting "appreciably" for "noticeably." There was correspondence between the parties, and in the end the defendant said he would fight the case as he had been told that the plaintiff company had no right to the word "Lissen."

His Lordship said that in this case, where the trade-mark was unregistered, all the plaintiff company could do was to obtain an injunction restraining passing-off. It had been pointed out by another judge that if a mark was registered a man could be restrained from using it, but where it was unregistered all that could be done was to restrain a man from selling an article bearing a label containing the mark without clearly distinguishing his goods from the goods of the plaintiff.

Mr. Burrell said that the difficulty about registering the word "Lissen" as a trade-mark was that it formed part of the company's name, but the company thought that sufficient time had elapsed to enable it to apply to have the name registered.

Mr. Harley said that he had no intention to defraud. The label on the goods was not his, but was given to him to use on the batteries. He was quite willing to distinguish his goods from those of the plaintiff company.

His Lordship granted an injunction restraining passing-off, and directed each party to pay its own costs.

Business and Industrial Notes.

The Week's Electrical Trade News from all Sources. Commercial and Industrial Developments. Business Changes, Market Prices for Materials, Trade Openings, New Publicity Literature, Liquidations and Failures.

Registered Electrical Contractors.

At the last meeting of the Executive Committee of the National Register of Electrical Installation Contractors applications for registration from the following were accepted:—

Fletcher & Jones, Cardiff.
Glamorgan Electrical Co., Cardiff.
Wardley, R., Castleton, Manchester.
Glenville, S. J., South Shields.
Fishbourne, W. J., Newbridge, Mon.
Driver & Peterson, South Shields.
Daly, Thomas, & Son, Darlington.
Linzell Dickinson & Co., Stoke Newington, N.16.
Pearn & Carson, Plymouth.
Coolmore Electrical Works, Belfast.
McBride & Nuttall, Fairfield, Liverpool.
Griffey, E. L., Bath.
Nutter, E., Nelson, Lancs.
Wills, A., & Sons, Ltd., Bath.
Locke & Soares, London, W.1.
Beabey, O., & Co., Liverpool.
Ribton, C. P., Ltd., Liverpool.
Atkinson & Beanland, Liverpool.
Bloomfield, E. E., Braintree.
Woolliscroft, J. H., & Co., Liverpool.

At the same meeting one application was withdrawn and nine were declined.

Recent Contracts.

The Automatic Telephone Mfg. Co., Ltd., has sent us further particulars of the contract for automatic telephones in Manchester recently received from the Post Office. The equipment is to be installed in the new Chapel Street and Blackfriars exchanges, and forms part of the programme for the conversion of all telephones in the Manchester area to the "Strowger" automatic director system. The system will be generally similar to that adopted for the Greater London area. The two exchanges will be housed in the same building, Chapel Street exchange being equipped with manual positions for handling the bulk of the inter-exchange traffic in the area and also toll and trunk traffic, whilst Blackfriars will contain 10,000 lines of "Strowger" automatic director equipment for subscribers in the centre of the city. The present order for Chapel Street provides for 244 operators' position, including "A" positions, key-sending "B" positions, and inquiry positions.

The Liverpool Corporation has placed an order with the Equipment & Engineering Co., Ltd., for one 4-gun "Cyclone" car washer.

Price Reductions.

Metro-Vick Supplies, Ltd., announces that it has reduced the price of its Type S.P.42/U valve, which is a double-anode rectifying valve for full wave rectification, suitable for use in h.t. battery eliminators and for charging h.t. accumulators. It is of the indirectly-heated type provided with an equipotential cathode.

The British Thomson-Houston Co., Ltd., states that it has reduced the price of its "C2" loud-speaker.

New Municipal Showrooms.

The new showrooms of the Lancaster Electricity Committee in North Road, which have cost £10,000. were opened by the Mayor of Lancaster last week. Councillor R. Roberts (chairman of the Electricity Committee) presided, and referred to the progress of the works since 1922 under Major Milnes (the electrical engineer), to whom he paid a high tribute. An exhibition of electrical appliances followed the ceremony.

Application to borrow the sum of £6,000 for the erection and equipment of a new building in Standishgate to be utilised as an electricity showroom, offices, &c., is being made by the Wigan Corporation.

Employment During September.

The October *Ministry of Labour Gazette* says that during September employment in the engineering industry remained very slack on the whole, although conditions were rather better than in August, owing to improvements in the motor vehicle and constructional sections. Conditions remained fairly good in electrical engineering. The number of unemployed in the engineering industry declined by 3,662 to 97,074; the proportion thus falling from 10.4 to 10 per cent. The number of unemployed in the electrical engineering branch fell from 4,168 to 4,111, and the percentage from 5.4 to 5.3. In the electrical wiring and contracting industry there was also an improvement, the unemployment figure falling by 223 to 1,049, and the proportion from 8.9 to 7.3 per cent. On the other hand, there was a rise of 125 in the electric cable, wire and lamp manufacturing group, the proportion of unemployed increasing from 5.3 to 5.4 per cent.

Wages of Electrical Employés.

According to the October *Ministry of Labour Gazette*, the average of the recognised time rates of wages of wiremen employed by electrical contractors in 12 of the largest towns at the end of September, 1928, was 74s. 5d. a week, compared with 39s. 4d. a week at August, 1914, showing an average increase of 89 per cent. As the normal weekly hours of labour, which were usually 53 or 54 in 1914, were reduced to 47 in engineering industry declined by 3,662 to 97,074, the proportin hourly rates since 1914 is greater, being about 110 per cent. The average rate for unskilled labourers in the electricity supply industry in over 50 towns at September, 1928, was 55s. 8d. a week, compared with 26s. 6d. a week in August, 1914, showing an increase of 110 per cent. In this case also the hours of labour have been reduced, and the increase in hourly rates amounts to 140 per cent.

The Sale of Appliances in Victoria.

After a visit to Great Britain and the United States, the secretary of the Victorian Electricity Commission recommends that the Commission shall undertake the sale of domestic electrical appliances to its consumers on an extensive scale. The Commission has already made limited experiments in this direction by opening sales depôts in two towns, and satisfactory results have been reported. The high cost of appliances as the result of heavy import duties has made an extended-payment system essential to development, and this is one of the first matters to which the Commission will devote attention.

Local Exhibition.

Crowborough.—The Weald Electricity Supply Co., Ltd, last week held an electrical exhibition at Crowborough, which was opened by Mr. John Glynn. He was introduced by Sir Thomas Callender, chairman of Callender's Cable and Construction Co., Ltd.

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Commercial Travellers' Concert.

An informal evening concert of the Electrical Trades' Commercial Travellers' Association was held on Friday, October 19th, at the British Commercial Travellers' Club in New Oxford Street, W.C.1.

Machine Shop Lighting.

A photograph, reproduced herewith, has been sent to us, *apropos* the current Factory and Workshop Lighting Campaign, by the Walsall Hardware Manufacturing Co., Ltd. It shows

A Walsall Hardware Machine Shop.

one of the company's machine shops which has recently been re-wired on up-to-date lines. The company claims it to be one of the best-lighted shops in the district.

Book Notices.

"Education for Industry and Commerce" (with a preface by Lord Eustace Percy). Pp. 103. London: Stationery Office. Price 6d. net paper, 1s. 6d. net cloth. This is a pamphlet prepared by the Board of Education (Industry Series No. 1), and it is described as "a survey of the existing arrangements for co-operation between industry, commerce and the professions and the technical school system of England and Wales." In the course of the survey mention is made of the National Certificate system under which 71 schools have schemes for the issue of "ordinary" certificates, of which 38 are approved also for the issue of "higher" certificates; five schools are approved for "ordinary" diplomas and three for "higher" diplomas in electrical engineering. Reference is made also to the work of the Electrical Contractors' Association in encouraging young workers to take advantage of existing facilities for technical instruction, and to the joint advisory committee formed by the Association, the I.E.E. and educational bodies. Another matter to which attention is given is the examinations of the City and Guilds of London Institute in magnetism, electricity, &c.

"Electro-Chemical Deposition of Metals." Publication No. 17 of Messrs. Fescol, Ltd. Price 2s. 6d. net.—Considerable information is given in this book on the "Fescol" process of electro-chemical deposition, and many illustrations of actual work done. Messrs. Fescol, Ltd., cordially invite any of our readers interested in the process to visit their works, by appointment.

"*Journal* of the Institution of Electrical Engineers." Vol. LXVI. October, 1928. London: E. & F. N. Spon, Ltd. Price 10s. 6d.

The title of our contemporary, *The Electric Railway and Tramway Journal* has been changed to *The Electric Railway, 'Bus and Tram Journal.*

Electricity Scheme Contracts.

Further contracts for foundation work in connection with the Central Scotland electricity scheme have been placed by the Central Electricity Board. With a tender of just under £5,000, Mr. T. P. Jamieson, Baillieston, has been awarded the contract for the foundations of the new station at Bonnybridge, while two others, each for approximately £4,000, have been given to Mr. T. Miller, Dunfermline, and Messrs. William Bain & Co., Coatbridge, for the sub-station foundations at Dalmarnock and Clydesmill respectively. Messrs. Melville, Dundas & Whitson, Glasgow, who are to undertake similar work at Yoker, have secured the additional contract for the foundations for the towers at the river crossing of the Clyde and Cart with a tender of approximately £4,000.

Messrs. Braithwaite & Co., Ltd., have secured a contract for between 5,000 and 6,000 lattice towers for the South-Eastern Electricity Scheme. These towers will be made at the company's Newport works, and the work will be sufficient to keep one section of the works going for the next six months, although it will not involve the employment of many more men.

An Important Soviet Agreement and Contract.

It was reported last week that the Soviet Government, through the "Amtorg," its New York trading organisation, has agreed to negotiate for the settlement of the claims of the International General Electric Co. against the former Russian Government. At the same time a contract has been placed for electrical equipment valued at between one and two millions sterling, spread over two years, 25 per cent. of the cost to be paid before shipment.

Long-Service Certificates.

At the function mentioned in our last issue, at which Sir George Sutton, Bt., presented long-service certificates at North Woolwich works to Henley employés with from 20 to 56 years' service, Mr. H. Savage, the works manager, said that out of a total of 200 employés with over 20 years' service, only three were absent through illness. In the course of his speech Sir George Sutton said that they met as fellow-workers, each having done something to promote the success of the company. They had given the greater part of their lives to the success of the concern. For nearly 50 years he had been moving amongst the employés of that factory, but not many were there now who were there when he first came. The best thing he had done in life was to work. It was not what they did, but the quality of it that had built up Henley's and placed it on the pinnacle of commercial achievement. Sir George said he thought the certificates would be valued by their descendants. The company present included Mr. R. J. Hatton, for so many years works manager at North Woolwich and now a director of and consulting engineer to the company; Mr. P. Rosling, the general manager; Mr. W. F. Bishop, the assistant general manager; and Mr. P. Dunsheath, the chief of the Research Department at Gravesend.

"Xcel" Fires.

We regret that in the article upon electric fires in our last issue the name of one of the "Xcel" fires illustrated was incorrectly spelt—it should have been "Cosyglo." The spelling "Cosyglow" is used by another company.

A Henley Wiring System Campaign.

In the advertisement section of this issue appears the first of a series of advertisements by W. T. Henley's Telegraph Works Co., Ltd., which form part of the company's winter campaign to promote the sales of its wiring system. The suggestive title "The butcher, the baker, the . . ." is employed in each, indicating the universality of the system. The illustrations are reproductions of actual photographs of the individuals who can be looked on as prospective clients. The advertisements also contain an offer of overprinted "literature" for contractors.

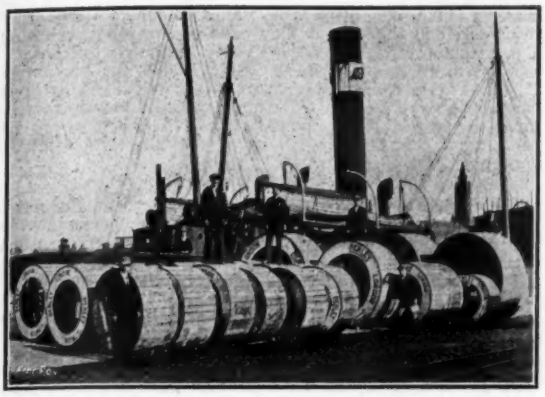
A Henley Display at Croydon.

Another phase of the company's activities in this direction is illustrated herewith. This picture shows a display which recently appeared in one of the showroom windows of the Croydon Electricity Department. The unobtrusive nature of the Henley wiring system is demonstrated by the part of an installation seen in the background. There are also samples

of fittings and photographs of types of buildings wired in this way. In addition, a "telescoped" sample of Henley 33,000-V cable is shown.

Electrification in Ireland.

The accompanying illustration shows the second consignment of cable for the Lisburn (Northern Ireland) electrification scheme being unloaded on the Belfast Quay—a total of 35 drums, representing a total gross weight of over 63 tons, and a total length of 8,183 yards. The first shipment in connection with this contract, which is being carried out by W. T. Henley's Telegraph Works Co., Ltd., for the Lisburn



Henley Cable in Northern Ireland.

Electric Supply Co., Ltd., consisted of a total of 42 drums containing 10,535 yards of cable, the gross weight being over 81 tons. In connection with the overhead line portion of the contract, an additional consignment was made of 15 drums containing over 17,000 yards of 0.1 sq. in. (7/.136) h.c. bare copper strand, the total gross weight of which was over 10 tons.

Unemployment.

During the week ended October 8th there was a fall of 16,630 in the number of registered unemployed. The total on the date mentioned was 1,319,700, as compared with 1,336,380 on October 1st and 1,073,000 on October 10th, 1927.

Railway Electricians' Wages.

The Industrial Court, upon the application of the four railway groups, has sanctioned a reduction of 2½ per cent. in the wages of men employed in railway power stations, sub-stations, and h.p. cable systems. A similar reduction was voluntarily conceded by the main body of railwaymen some weeks ago.

New London Showroom.

Owing to increasing business in the London area, a convenient and well-arranged showroom has recently been opened

Messrs. Shaw's New Showroom.

by Messrs. John Shaw & Sons, Wolverhampton, Ltd., at 29-30, Shoe Lane, E.C.4, for the use of the electrical contracting and retail trade. The showroom is tastefully decorated, and includes a three-tier stand in the centre of the room for the display of apparatus. Practically the whole of the appliances are of the company's own design, and the lighting fittings are of original and attractive appearance. Although lighting fittings predominate, there is a large variety of domestic appliances, including "Trojan" fires, heaters, irons, vacuum cleaners, &c., and a new bowl-shaped heater-cooker, which, when standing upright, may be used for simple cooking operations, or, when tilted, can be used for heating. The work of converting the premises into a showroom, stores, &c., has

Interior of Messrs. Shaw's Showroom.

been carried out by Mr. A. G. Jones, manager of the company's electrical department. The exterior and interior of the showroom are shown in the accompanying illustrations.

A Name Wanted for Moulded Insulation.

The Moulded Insulation Section of the American National Electrical Manufacturers' Association is offering a prize of $250 for a new name to cover artificial gum insulating products capable of setting into a hard, non-softening body. It is stipulated that names must not be based on the ingredients now used, as they may change as the industry develops.

A New Belgian Electrical Department.

With the title L'Office Central d'Electricité et d'Electro-Mécanique, a special department has recently been set up in Brussels by the Belgian Government. Its duties will be to design and manage all electrical and electro-mechanical installations of Government departments; to enforce the Acts and regulations in force in the country relative to the generation, transmission and distribution of electric power and the utilisation of water power; to enforce the Acts and regulations relative to the prices charged for supply by distribution concessionaires; to carry out tests of electrical material, machinery and apparatus; and to operate the electric lighting and power plants at the ports, pumping stations and navigable waterways under State control, with the exception of the River Scheldt.

Wages in the Electricity Supply Industry.

Negotiations between the electricity supply authorities and their employés having proved fruitless, an application is to be made by the trade unions concerned for a decision of the Industrial Court. They ask for the termination of the existing cost-of-living sliding scale arrangement, and for an increase of 10 per cent. upon the rates prevailing at the end of the present agreement for the stabilisation of wages, that is, on December 31st.

For Sale.

Newport Corporation Electricity Department has for disposal one 37-kW Belliss-steam dynamo set. Mansfield Corporation invites offers for surplus steam and electrical generating plant, &c. (See our advertisement pages to-day.)

North-West England and North Wales Electricity Scheme, 1928.

The Central Electricity Board having adopted the above scheme, has published particulars of the scheme. Copies can be obtained at the price of 1s. 6d. each from H.M. Stationery Office. (See our advertisement pages to-day.)

Italian Electric Lamp Production.

The production of the Italian electric lamp industry continues to increase, says *Il Sole*. It has risen from 5,000,000 in 1922-23 to 13,500,000 in 1926-27, an increase of 170 per cent. Complete data for the whole of the financial year 1927-28 are not yet available, but from reports for the first eleven months it appears that there has been a substantial increase, the output having risen from 12,335,000 to 13,254,000, an increase of 8 per cent.—*Reuter's Trade Service* (Rome).

New Catalogues and Lists.

Standard Telephones & Cables, Ltd., Connaught House, Aldwych, W.C.2.—An illustrated brochure containing an interesting description of the company's cathode ray oscilograph.

Cinema Traders, Ltd., 26, Church Street, W.1.—A comprehensive priced and illustrated catalogue of kinematograph equipment, including lighting apparatus of various kinds.

The British Thomson-Houston Co., Ltd., Rugby.—An index of the company's technical publications; Descriptive List No. 3311-A, dealing with truck-type switchgear; and Descriptive List No. 4176, relating to ironclad oil-immersed thermal circuit breakers.

Korting & Mathiesen Electrical, Ltd., 711 & 715, Fulham Road, S.W.6.—The "Kandem Quarterly Review," containing illustrated notes on industrial illumination.

The Tudor Accumulator Co., Ltd., 2, Norfolk Street, W.C.2.—A series of illustrated and priced leaflets advertising the company's accumulators for radio work.

The Midland Electric Mfg. Co., Ltd., Barford Street, Birmingham.—A folder describing the "MEM8" all-insulated double-pole switch and fuses. Illustrated and priced. Also a useful booklet dealing with the selection and operation of medium-pressure electrical switch- and fuse-gear. Information on the manufacture of porcelain appears, and reference is made to certain of the company's products.

The Saxonia Electrical Wire Co., Ltd., Roan Works, Greenwich, S.E.10.—A reference table giving equivalents for s.w.g. sizes, with particulars of weights, resistances, &c., of h.c. circular soft copper wires.

Messrs. H. D. Douglas & Co., Ltd., 7, Victoria Street, S.W.1.—An illustrated folder dealing with multiple fibre conduit suitable for underground h.p. cables.

The British Thomson-Houston Co., Ltd., Mazda House, Newman Street, Oxford Street, W.1.—Folder No. L.448, containing illustrated particulars and prices of "Mazdalux" reflectors and "Glassteel" diffusers for industrial illumination.

Messrs. L. G. Hawkins & Co., Ltd., 30-35, Drury Lane, W.C.2.—A card showing what one pennyworth of electricity will do (based on a rate of 6d. per kWh) employed with various "Universal" domestic appliances.

Messrs. Thos. W. Ward, Ltd., Albion Works, Sheffield.—A brochure produced in connection with the company's jubilee. It contains a history of the company and those connected with it, views of the Albion Works, and particulars of the company's products.

Messrs. Hailwood & Ackroyd, Ltd., Morley, near Leeds.—Three illustrated and priced pamphlets, one in colour, dealing with the company's lighting glassware—bowls, globes, shades, &c.

The Sun Electrical Co., Ltd., 118 & 120, Charing Cross Road, W.C.2.—Two illustrated folders advertising "Yale" torches and batteries. Priced.

The Benjamin Electric, Ltd., Brantwood Works, Tariff Road, Tottenham, N.17.—A brochure dealing with the production and merits of the company's one-piece reflectors and a booklet (No. 1030) containing illustrated details and prices of these.

"M.K." Electric, Ltd., Wakefield Street, Edmonton, N.18.—A pamphlet containing illustrations and prices of the company's new horizontal 3-pin 15-A interlocking switch-plugs.

A.F.A. Accumulators, Ltd., 120, Tottenham Court Road, W.1.—Illustrated and priced leaflets dealing with "Varta" accumulators and "Pertrix" dry batteries.

Trade Announcements.

An arrangement has been entered into between Messrs. Alfred Herbert, Ltd., and Wild-Barfield Electric Furnaces, Ltd., whereby Messrs. Alfred Herbert, Ltd., in addition to representing Wild-Barfield Furnaces in Scotland, India, Uruguay, Paraguay and Argentina, will in future also introduce and sell these furnaces from all their British branches.

The Rothermel Corporation, Ltd., has been appointed export sales manager, for the British Isles, for the American group of automobile replacement parts and equipment factories represented by Mr. H. L. Kraus, of New York.

The British Thomson-Houston Co., Ltd., has opened a new "Mazda" lamp stores and trade counter at 130, George Street, Edinburgh. Telephone: Edinburgh 30896; telegraphic address: "Asteroidal, Edinburgh."

Woodfyt Sales, Ltd., has removed its showrooms to 10a, Newman Street, W.1.

Messrs. S. G. Leach & Co., Ltd., 26-30, Artillery Lane, London, E.1, and Messrs. M. W. Woods, Ltd., Colchester, have entered into an association of interests, under which Messrs. Leach will act as the sole selling organisation for the Colchester works' productions. Mr. M. G. Woods has joined the board of Messrs. S. G. Leach & Co., Ltd., and will take over the charge of the fan and motor departments.

The registered office of Insulated Wires, Ltd. (director, Mr. W. J. Hawkins) is 8, New Zealand Avenue, Barbican, London, E.C.1.

Industrial Selling and Advertising.

On Friday next, November 2nd, at 1 o'clock, at the First Avenue Hotel, High Holborn, Mr. F. Rowlinson, Publicity Manager to Messrs. Mather & Platt, Ltd., Manchester, will read a paper on "The Relations between the Sales Department and Advertising Department in Industrial and Engineering Companies," at the first luncheon meeting organised this session by the Engineering Section of the Incorporated Society of British Advertisers. A discussion will follow. Mr. J. Taffs, advertising manager of the English Electric Co., Ltd., will preside.

Social Events.

On October 8th the employés of Messrs. S. G. Leach & Co., Ltd., gathered at the Talbot Restaurant, London Wall, for a staff dinner. Mr. S. G. Leach was in the chair, and he made reference to a number of employés whose service covered over 20 years. Mr. W. J. Wiles and Mr. M. G. Woods, who recently joined the Board, were given a welcome. An informal musical and dance programme followed the dinner.

The G.E.C. Social and Athletic Club reports that it is running four teams in the West End Amateur Football League this year, and that so far they have proved very successful. Two teams are being fielded regularly in the Netball League, while two Badminton courts are available for play. The G.E.C. Choral Society has also started work, and proposes staging two operas, one to be produced this month and the other in March. The Swimming and Tennis Sections are continuing their activities, so far as possible, throughout the winter months.

Irish Free State Electrical Imports.

The Irish Free State Ministry of Industry and Commerce has issued detailed figures of imports during the six months ended June last, comparing them with the corresponding period of 1927. From these we have compiled the appended table, showing the value of the total imports of electrical machinery and apparatus into the Free State and the amount attributed to the United Kingdom, as country of shipment but not necessarily of manufacture:—

	Total Imports. Jan. to June.		U.K. Share. Jan. to June.	
	£	£	£	£
Electric wires and cables ...	91,131	57,687	21,883	21,989
Telegraph and telephone instruments and apparatus	5,779	21,081	4,845	17,785
Electric lamps and parts ...	21,244	19,136	15,916	15,652
Batteries and accumulators	11,539	12,548	10,533	12,036
Radio sets and parts ...	40,407	35,307	39,832	34,279
Other electrical goods and apparatus	43,573	40,096	29,514	30,894
Generators	4,978	6,258	4,703	5,964
Motors	11,985	11,028	5,786	8,747
Other electrical machinery	53,010	43,373	32,992	38,160
Totals	£283,646	£246,514	£169,004	£185,496

Of the imports, £169,004, or approximately 60 per cent., came from ports of the United Kingdom, leaving £114,642 for foreign countries, the bulk of which is credited to Germany.

The imports of electrical goods, excluding machinery, during August last amounted to £39,210, bringing up the total for the first eight months of the year to £285,921, as compared with £246,056 in the corresponding period of 1927.

Bankruptcy Proceedings.

H. Gateshill, 113, Witham, Hull, wireless engineer.—The public examination of this debtor was held recently at Hull. The statement of affairs showed liabilities of £230, against assets of £49. Debtor attributed his failure to the making of a bad debt of £40, bad trade during the summer, &c. He stated that he had been in business as a wireless engineer until May, 1928. He did not keep any books. The examination was closed.

N. Tizzard, trading with another as "Tizzard Brothers," 27, Dalkeith Street, Barrow-in-Furness, and 121, Market Street, Dalton-in-Furness, Lancs., electrical engineer and contractor.—The application for discharge of this debtor was heard recently at Barrow-in-Furness, and the discharge was granted. The receiving order was made in August, 1925.

L. A. N. Dixon (C. Forgham & Co.), electrical engineer, 23a, Princess Street and Old Post Office Yard, Shrewsbury.—First and final dividend of 3s. 9½d. in the £, payable at the Official Receiver's offices, 22, Swan Hill, Shrewsbury. (The above notice is in substitution for notice of a dividend of 3s. 11½d. in the £ published in the *London Gazette* of September 14th, 1928, the dividend then advertised not having been paid.)

H. Wood, electrical and radio engineer, Market Place, Meltham.—First meeting held October 24th; public examination November 7th; both at the County Court House, Huddersfield.

G. B. Banks (Redditch Radio Co.), radio engineer, 16, Market Place, Redditch.—Composition of 13s. 4d. in the £, payable at the Official Receiver's office, 191, Corporation Street, Birmingham.

H. W. Beesley, motor cycle and wireless engineer, High Street, Brackley, Northants.—First meeting October 27th, at 37, Cornmarket Street, Oxford; public examination, November 14th, at the Town Hall, Banbury.

J. Cave and T. W. Bowler (Taylor & Wynne), electrical engineers, back of 180, Green Lane, Small Heath, Birmingham.—First meeting October 26th, at the Official Receiver's office, 191, Corporation Street, Birmingham; public examination, November 7th, at the Court House, Birmingham.

J. A. and G. J. D. Hartigan (London Fan & Motor Co.), electrical engineers, 81, Charlotte Street, W.—Last day for proofs for dividend, November 2nd. Trustee, Mr. E. H. Hawkins, 4, Charterhouse Square, E.C.

Company Liquidations.

Cooper Bond, Ltd., Hither Green, S.E.—A meeting of creditors was held on October 15th, when Mr. W. R. Clemens, 27, Finsbury Square, E.C., the liquidator, presided. The statement of affairs showed liabilities of £10,487 and net assets of £6,424, leaving a deficiency of £4,063. The company was formed in 1921 to deal in electric signs. Later it acquired an interest in an accumulator firm, and it was entitled to receive 80 per cent. of any future interests in that concern, which might be a valuable asset in the future. It was decided that the liquidation should be continued with Mr. Clemens as liquidator. An informal committee of inspection was also appointed.

T. L. Kay & Co., Ltd., Blake Street, York, wireless engineers, &c.—The statutory meeting of creditors was held recently at the offices of Messrs. F. C. Gardner & Co., York.—The statement of affairs showed liabilities of £4,031 and net assets of £989. A resolution was passed confirming the voluntary liquidation of the company, with Mr. H. Gardner as liquidator.

Hall Telephone Accessories, Ltd.—A meeting of members is called for November 20th, at 115, Old Broad Street, E.C., to hear an account of the winding up from the liquidator.

Accumulators of Woking, Ltd., London.—A meeting of creditors was called for October 19th at the offices of the receiver and manager, Mr. H. Tansley Witt, 5, Chancery Lane, W.C.2. Only one creditor attended, and no resolutions were passed. The voluntary liquidation of the company will be continued with Mr. Witt as liquidator.

Dissolutions of Partnership.

Thatcham Electric Lighting Works.—Mr. C. Gunter, jun., Mr. A. H. Brown, and Mr. C. G. Brown, jun., have dissolved partnership, the business having been acquired by the Wessex Electricity Co. as from July 1st.

Sweetman & Ansell, electrical engineers, 3, Bell Street, Reigate.—Mr. A. P. Ansell and Mr. J. Sweetman have dissolved partnership. Mr. Ansell will attend to debts and continue the business under the style of A. Ansell.

District Gramophone & Wireless Supply Co., gramophone and wireless dealers, 100 & 107, Tower Bridge Road and 323 Old Kent Road, S.E.—Messrs. J. A., M., B. and A. Isaacson have dissolved partnership. Mr. J. A. Isaacson will attend to debts.

Prices of Materials.

Messrs. F. Smith & Co. report, October 23rd:—Copper (electrolytic) bars, £72, 5s. inc.; ditto ditto sheets, no change; ditto ditto wire rods, £82 15s., 20s. inc. Ditto ditto h.c. wire, no change.

Messrs. James & Shakespeare report, October 23rd:—No change in copper and lead prices.

Messrs. Edward Till & Co. report, October 23rd:—India-rubber, Para fine, 11d., ¼d. inc.

Lighting and Power Notes.

Ashford (Kent).—New Plant.—The Urban District Council has installed at the electricity works a new 900-h.p. solid injection eight-cylinder vertical oil engine, supplied by Davey, Paxman & Co., and this will be officially started by Mrs. Hayward, wife of the chairman of the Electricity Committee, to-day (Friday).

Bedford.—New Plant.—The Corporation Electricity Committee has prepared a scheme for the provision of sidings and coal-handling plant at an estimated cost of £13,850.

Bury (Lancs.).—Electricity Charges.—The Town Council has made alterations in some of the charges for electricity. The present scale for motor power is retained for the ordinary class of consumers, but a special tariff has been introduced for consumers who agree to take a supply for a period of not less than five years, and to guarantee a minimum annual payment of £200. The scale is 2d. per kWh for the first 1,000 kWh per quarter, 1½d. per kWh for the next 1,500; 1d. per kWh for the next 35,000; 0.8d. per kWh for the next 125,000; and 0.6d. per kWh beyond. The lighting for such consumers is to be charged at the rate of 10 per cent. of the power consumption at the consumer's average power rate, and the remainder at 3d. per kWh. Cookers and wash boilers are to be hired out at 2s. 6d. per quarter. Electrical apparatus is to be sold on the hire-purchase scheme, and the selling price is to be 5 per cent. over the list price for purchase in one year, and 10 per cent. for two years.

Cookham.—Electricity Charges.—The Cookham and District Electricity Corporation, Ltd., has reduced the charge for electricity for lighting on the flat rate to 11d. per kWh. A new residential subscription rate for all domestic purposes has been introduced, which consists of a fixed quarterly charge based on the number of rooms, plus 2d. per kWh.

Canada.—Water-Power Rights.—The Ottawa correspondent of *The Times* reports that the hearing of the "water power" case, involving the relative rights of the Dominion and the Provinces of Canada in the navigation and electrical power development of the boundary waters and navigable rivers such as the St. Lawrence, was concluded on October 15th, and the Supreme Court reserved judgment, which is not expected to be given for several months.

Crawley.—Inquiry.—A Ministry of Transport inquiry was held on October 16th with reference to the charges for electricity made by the Sussex Electricity Supply Co. A number of consumers contended that the charges were too high, and Mr. B. M. Cloutman, K.C., for the applicants, said that the charge had risen from 6d. per kWh in 1914 to the present charge of 1s. per kWh in 1921. The undertaking was then acquired by the company for £25,000, and it had never paid a penny in dividends. The undertaking had the highest capital expenditure in the country for its class, and it had spent 50 per cent. more in management than any other company in England of its type. Mr. W. Craig Henderson, K.C., counsel for the company, said that it had had to carry out extensive reorganisation of plant, and to-day, with a charge of 1s. per kWh the revenue barely gave the company enough to meet the depreciation allowances and pay interest. He submitted that there was no justification for the application, and that a reduction in price would not be in the real interest of the consumers.

Dover.—Loan.—The Town Council has applied for sanction to a loan of £3,800 for a new switchboard at the electricity works, and for a new feeder cable to Buckland.

Glasgow.—Progress during September.—Under the Corporation Electricity Department's scheme, 393 houses were wired in september, making the total to date 9,388. The number of applications for the hire of appliances was 326, making the total 20,448.

Mains Extensions.—The Electricity Committee has recommended extensions of distributing mains, at an estimated cost of £6,000.

New Generator.—A generator weighing 71 tons, made at the Stafford works of the English Electric Co., Ltd., for the Dalmarnock power station of the Glasgow Corporation, was unloaded from a vessel at Finnieston Quay, Glasgow, on October 15th. The generator had been sent by road to Birkenhead, where it was shipped and was conveyed through streets devoid of traffic on an eight-wheel bogey of over ten tons. Parts of some of the streets had to be specially strengthened before the procession of traction engines and the cylinder could be allowed to pass.

Grimsby.—Electricity Supply.—The Corporation Electricity Committee is to provide a supply of electricity to Tetney village, at a cost of £3,300.

Halifax.—Electricity Charges.—The Electricity Committee recommends a reduction of 1d. per kWh (to 6d.) in the flat rate for lighting up to 1,200 kWh per quarter. A new scale for combined house and shop premises is proposed, consisting of a fixed annual charge, plus ½d. per kWh, for electricity used. The Committee also recommends some small alterations in charges for power and other purposes.

Lincolnshire.—Electricity Supply.—At a recent meeting of the Spilsby Rural District Council, which exercises administrative control over a large Lincolnshire area, consideration was again given to Mr. R. Borlase Matthews's scheme for the electrification of many parts of the county. The Council had lodged a formal objection to the project, the chairman stating that it was not thought desirable to give approval right away. Mr. Matthews had pointed out that a rural electrification scheme depended for its success upon the complete electrification of a large area, embodying both urban and rural consumers. Any diminution of the area must of necessity impair the success of the scheme, and the promoter was not prepared to undertake the electrification of the rest of the proposed area if those parts for which the Yorkshire Electric Power Company and the Boston and District Electric Supply Co., Ltd., had respectively made applications, were taken away from him.

London.—Stepney.—The Electricity Supply Committee has submitted to the Borough Council for approval the abstract of accounts of the working of the electricity undertaking for the year ended March 31st last. The capital expenditure at the end of the year was £1,900,142. The income from all sources amounted to £326,386, and after deducting expenditure, including interest and repayment of loans, there was a net surplus of £27,526. The electricity sold increased to a greater extent than in any previous year, considerably over five million kWh more than in 1926-27 having been sold. Nearly half of this increase was taken for lighting purposes, which indicates the success of the Council's scheme of assisted wiring, 1,166 flats and tenements having been wired and connected. The number of new services connected was 2,774, a record for the undertaking.

Fulham.—The Borough Council Electricity Committee is to erect sub-stations at Barton Street and Rigault Road at a cost of £2,500.

Stoke Newington.—Mains extensions are to be carried out by the Borough Council Electricity Committee at a cost of £1,326.

Hammersmith.—The Borough Council Electricity Committee has considered schemes to meet the anticipated increased demand during the coming winter, and has recommended that four uneconomical generating sets, with a total capacity of 8,500 kW, be replaced by one new set of a normal rating of 8,500 kW (maximum continuous rating, 10,000 kW), at an estimated cost of £43,500.

Portland.—Loan.—The Urban District Council Electricity Committee is applying for sanction to a loan of £10,000 for works in connection with the electricity scheme.

Portsmouth.—Electricity in Bulk.—At a recent meeting of the Corporation Electricity Committee the electrical engineer reported receipt of a letter from Messrs. Baily, Grundy and Barrett, Ltd., containing the following proposals with regard to the Midhurst bulk supply: That consideration be given to carrying the cable as far as Cocking; that advantage of the latest and more favourable bulk supply terms be given to the Midhurst Company; and that some concession be made during the first year of operation. The Committee has decided to make no concession regarding the extension to Cocking, but is to reduce the kVA charge from £6 8s. to £6 per annum; and to allow the period for the payment to the Corporation of the first £600 to be extended by six months.

Preston.—Parliamentary Bill.—The Corporation is taking steps to promote a Parliamentary Bill for the construction of regulating sluices for impounding water from the River Ribble, to provide a constant flow of water for the Ribble power station. At present the supply of water is sufficient, but the Corporation is preparing for future contingencies. The estimated cost of the scheme is £70,000.

Price Reductions.—Reductions in the charges for electricity have been made or recommended in the following districts:—

Jedburgh.—*Scottish Southern Electric Supply Co., Ltd.*—Lighting: Public buildings from 10½d. to 5d. per kWh; private consumers from 1s. to 9d. per kWh. Heating: 4d. per kWh. Power: Up to 10 h.p., 5d. per kWh.

Mold.—Lighting: From 8d. to 7d. per kWh.

Rothbury.—Overhead Lines.—In connection with the repeated protests against the erection of poles for overhead transmission lines in the district, it was stated at the last meeting of the Urban District Council that a letter had been received from the Ministry of Transport giving consent to the Newcastle Electric Supply Co., Ltd., to erect the poles as proposed.

Sheffield.—Loans Sanctioned.—The City Council has received sanction to borrow £100,000 for the construction of a generating station and works incidental thereto, £30,000 for the equipment of a generating station, and £165,000 for services.

Special Orders.—Application has been made to the Electricity Commissioners by the Alton District Electricity Co., Ltd., for a Special Order authorising it to extend its area of electricity supply so as to include parts of the rural district of Alton.

The Commissioners have submitted to the Minister of Transport for confirmation Special Orders made by them authorising Gravesend Corporation to supply electricity within the rural district of Strood, and the Woodstock Power Syndicate, Ltd., to supply electricity in the borough of Woodstock, and the parish of Hensington Without.

Stamford.—Purchase of Undertaking.—As a result of negotiations with the Urban Electric Supply Co., Ltd., the Corporation has decided, subject to the consent of the Electricity Commissioners, to purchase the local electricity undertaking of the company.

Stirling.—Loan Sanctioned.—Authority has been received by the Corporation to the borrowing of £2,000 for the installation of additional converting plant at the Dean Crescent sub-station.

Stone (Staffs.).—Electricity Charges.—The Urban District Council has decided that the charge for electricity for lighting for ordinary consumers shall be a flat rate of 9d. per kWh, whilst houses of a large type will have an alternative tariff based on a charge per room, with a decreasing charge per kWh according to consumption. For power there will be a sliding scale from 4½d. per kWh to 2d. per kWh.

Thornton-Cleveleys. — Loans. — To provide for future development of the electricity undertaking, the local Council has applied for sanction to the following loans: Public lighting, £2,000; mains and services, £10,000; and domestic appliances for sale, £1,000.

Torquay.—Correction.—In our last issue we stated that the Torquay Electricity Department had applied for sanction to a loan for extensions. The note in question related to the Worcester undertaking.

Walton-on-Thames.—Electricity Supply.—The Urban District Council is to extend the mains in Molesey Road in connection with 50 houses which are being erected by the Council. Sanction has been received to a further loan of £6,500 for electricity purposes.

Warrington.—Loan.—The Corporation Electricity Committee is applying for sanction to the borrowing of £20,000 for mains and services.

Weymouth.—Electricity Charges.—The Corporation Electricity Committee has fixed the following charges for the added areas: Lighting, 6½d. per kWh, plus 25 per cent. Heating and power, 1½d. per kWh.

Yorkshire.—Electrical Development.—The Yorkshire Electric Power Co. is to supply electricity to the South Yorkshire mining villages of Askern, Sutton, Norton, Campsall, and Moss.

Tramway and Railway Notes.

Blackpool.—Traffic Return.—For the period September 22nd to October 14th inclusive the passengers carried on the Corporation trams for the autumn illuminations numbered 4,592,876, an increase of 191,212 over last year. The receipts were £34,131, an increase of £2,021.

Bradford.—Railless Cars.—In an attack recently on the railless-car system, Mr. J. A. Guy, at the meeting of the City Council, declared that the city had lost £5,500 on it last year, and added that railless cars were being scrapped all over the country. The Council, however, decided to convert the Thackley tramway route to railless traction rather than relay the track.

Canada. — New Electric Railway. — According to the *Electric Railway Journal* the Winnipeg Power Company is planning to construct an electric railway to use surplus energy from the recently authorised project at Seven Sisters Falls. It is expected that this line will run from the Falls to Whitehouse, a distance of 14 miles, and thence 50 miles further south. The rails to be used have already been purchased and are ready to be laid. Interurban cars from the Winnipeg-Selkirk line for passenger service will be used. For heavier traffic it is proposed to buy second-hand electric locomotives. Plant equipment will probably be bought in Canada on account of duty difficulties. Not only is this a new development in power marketing, but it is the first electric railway of its kind in western Canada.

Continental.—Spain.—The electrification work having been completed, electric trains are now running on the Barcelona-Manresa section of the Northern of Spain Railway.

Work is well in hand on the electrification of the railway between Algorta and Plencia, and it is expected that electric trains will be running over the line by the end of the present year.

Hastings.—Railless Cars.—The Ministry of Transport has sanctioned the running of both double-deck and single-deck railless cars on the Bexhill section of the Hastings and District Electric Tramways Co.'s system.

London.—Underground Hold-up.—A faulty cable at Camden Town Junction, on the Hampstead and City Railway on October 19th threw the signalling apparatus out of gear, and it was found impossible to work the Highgate branch of the line, while the Edgware and Morden trains were disorganised. There were no trains running between Edgware and Camden Town in the early morning, and passengers were considerably delayed. It was not found possible to rectify the defect before the homeward "rush" hours, and considerable congestion occurred at the West End stations. Underground railway officials reported that by 9 p.m. the difficulties had been overcome, and a normal service resumed.

United States.—Railway Electrification.—The *Electric Railway Journal* states that d.c. at 3,000 V will be used by the Delaware, Lackawanna and Western Railroad for suburban trains on 173 miles of track to be electrified in the northern New Jersey zone, plans for which are now being made. This high-voltage system was decided upon because it seems the best suited to meet the operating requirements applying in both suburban and main line service, in the event that later it is considered desirable to carry the electrification of the road over the Pocono Mountains to Scranton and the anthracite coal fields.

Telegraph and Telephone Notes.

Australia. — Telephone Service. — Mr. William Gibson (Commonwealth Postmaster-General), describing the development of the Australian postal, telegraph, and telephone services in recent years, claimed that the charges were as low as in any country in the world. If Australia had charged the Canadian telephone rates the profit would have been £2,500,000, if the United States rates £2,000,000, British rates £1,600,000, and New Zealand rates £1,000,000. In the last six years £24,300,000 had been made available for capital expenditure, yet the Department had paid its way after providing annually for

interest £1,100,000, depreciation £630,000, and superannuation £288,000. Australia, Mr. Gibson said, was now the sixth country in the world with regard to telephone development per head of the population. The completion of the Perth-Adelaide circuit would render possible the longest telephone connection in the world, says the *Daily Telegraph*, namely, 5,000 miles, from Perth, Western Australia, to Cairns, North Queensland.

International Telephony. — Anglo-Italian Service.—As from October 18th the Anglo-Italian telephone service, hitherto available in Italy to Milan only, was extended to Turin and Genoa. For the present communication with Turin and Genoa will be restricted to calls to and from subscribers in the London telephone area.

Sofia-Bucharest Service.—Telephone communication was inaugurated on October 18th between Bucharest and Sofia by lines passing through the frontier towns of Rustchuk and Giurgevo.—*Reuter* (Sofia).

Telegraph Code.—Revision.—Following a recommendation by the International Radio-telegraph Conference last year in Washington, the British Government has assembled a committee of representatives of the principal maritime nations for the purpose of revising the international code of signals, and of compiling seven editions of the code in English, French, German, Italian, Japanese, Norwegian, and Spanish. The committee held its first meeting on October 16th in London at the Board of Trade. The chairman of the committee is Mr. Herbert G. Williams, Parliamentary Secretary of the Board of Trade.

The Telephone Service.—Birmingham's Stock Exchange.—Nearly one thousand business transactions are carried through daily by telephone at the new Birmingham Stock Exchange, which has just been completed at a cost of nearly £60,000 Telephonically, the building is thoroughly equipped; the authorities made arrangements to provide for no fewer than 600 instruments to be installed and, in addition to the general lines, each member has his own private line to his office. There are also a large number of private trunk lines which connect directly with other markets, so that continuous communication is possible between Birmingham and London, Liverpool, Manchester, Sheffield, and other centres.

Radio Notes.

Daventry.—Wave-length Change.—The B.B.C. announced last week that a slight alteration was made in the wavelength of Daventry (5XX) on October 19th. This station is now transmitting at a frequency of 192 kilocycles (wavelength 1,562.5 metres), instead of 187 kilocycles (1,604.3 metres).

Greece.—Broadcasting Monopoly.—It is reported from the Ministry of Communications in Athens that an international competition is being opened for the establishment and working of a radio monopoly in Greece for a period of 20 years. After the expiration of that period all the installations will pass free of charge into the possession of the State; after the lapse of ten years the State may take power to acquire by purchase the whole of the radio equipment. Within three months after the ratification of the concession the concessionaire will be required to form a Greek company in Athens, the share capital in which must be held to the extent of three-eighths by Greeks, and three-eighths of the directors are also to be natives. It is stipulated that a central transmitting station must be established in Athens, capable of ensuring "objectionless" reception throughout Greece. The details of the competition are shortly to be published and sent to Greek representatives abroad for public communication, and offers are to be sent in within three months to the Ministry of Communications, Radio Department, Athens.

Holland.—New Short-wave Transmitter.—A new short-wave c.w. transmitter, with call sign PBF5, is now operating from Eindhoven on a wavelength of 41.3 metres. The station is intended for communication with amateur stations throughout the world, and anybody who hears this station is requested to communicate with Philips Lamps, Ltd.

India.—Broadcasting to Continue.—The Indian Broadcasting Company announces that broadcasting in India will be continued, and that every effort will be made to make the broadcasting service a success.—*Reuter* (Bombay).

Mr. Eric Dunstan, general manager, recently tendered his resignation, together with those of several European members of his staff.

Relay Reception Service.—Darlington.—Radio relay proposals were mentioned in support of an application made to Darlington Streets Committee by the Broadcast Relay Service Co., of Clacton-on-Sea, for permission to run overhead wires from a receiving station which it proposes to erect in the town. The Committee recommended that permission be withheld on the ground that the wires might constitute a public danger. The company intends to establish relay stations in all large towns in the country.

Bolton.—An application of the Broadcast Relay Service Co. to the Bolton Corporation to supply subscribers with broadcast programmes by a single wire, across roads where necessary, has been deferred pending the acquisition of further information. A receiving set will be used at the firm's premises to furnish all-day relays to subscribers who need only loud-speakers, and who are requested to pay 1s. 6d. a week for the service, or 2s. 6d. a week if a cone loud-speaker is hired.

Sweden.—Receiving Licences.—The number of wireless receiving licences issued in Sweden continues to increase, and the total number issued is now 371,000, or 61 per thousand of the population.—*Reuter's Trade Service* (Stockholm).

Television.—B.B.C. Tests.—The British Broadcasting Corporation announced last week that in agreement with the Post Office, it required a studio demonstration of the Baird television apparatus before considering whether there should be public experiments in which a B.B.C. station would participate. A demonstration took place at the offices of the Baird Television Development Co., I td., on October 9th, and was attended by administrative and technical officials of the corporation. The opinion of the B.B.C. representatives was that, while the demonstration was interesting as an experiment, it failed to fulfil the conditions which would justify trial through a B.B.C. station. The Board of the Corporation has decided that an experimental transmission through a B.B.C. station shall not be undertaken at present, but it will review its decision if and when development justifies it.

Contract Information.

When "Contracts Open" are advertised in our "Official Notice" pages, the date of the Electrical Review containing the advertisement is given in parentheses below.

Contracts Open.

Australia.—Melbourne.—November 28th. Victorian Railways. One 10-ton overhead electric crane. (A.X. 6951.)*

December 18th. Department of Posts and Telegraphs. Motor-generator sets. (B.X. 4810.)*

December 11th. Telephone generators. (B.X. 4812.)* Instrument cords. (B.X. 4811.)*

Bristol.—November 12th. Port of Bristol Authority. Installation of telephone and electric hooter signalling systems on the Eastern Arm Extension of the Royal Edward Dock.

Canada.—November 19th. City of Winnipeg. Two 10,000-kVA and two 450-kVA generators for Slave Falls, Manitoba. (B.X. 4791.)*

Dublin.—November 12th. Dublin United Tramways Co. (1926), Ltd. General stores (including cables, lamps, electrical fittings, &c.) for 12 months. Forms of tender (2s. 6d.) from the company's offices, 59, Upper O'Connell Street, Dublin.

Egypt.—Ministry of the Interior. November 24th. Electric lighting installation for Sohag. (B.X. 4777.)*

Hull.—October 30th. Corporation. Electric lighting installation and fittings for the New East Hull Clinic, Durham House. Specification from the city architect.

India.—November 15th. India Stores Department. Motor alternator set and testing transformer for Government Test House, Calcutta. (B.X. 4790.)*

November 2nd. 10,000 yd. 40-wire composite cable. (See this issue.)

Irish Free State.—Dublin.—November 3rd. Borough Commissioners. Electric cookers, meter boards, house-service fuses and automatic cut-outs. Forms of tender (5s.) from the City Electrical Engineer.

Kildare.—November 1st. County Council. Electric wiring installation for the Courthouse and offices of the Committee of Agriculture and N.H. Insurance office, Naas. Specifications (£2 2s.) from Messrs. McEntee & O'Kelly, consulting engineers, 23, O'Connell Street, Dublin.

New Zealand.—Wellington.—December 20th. New Zealand Government Railways. Sub-station equipment for Frankton Junction power and signalling supply. (B.X. 4771.)*

November 13th. Public Works Department. Transformers. (B.X. 4775.)*

October 31st. Banks Peninsula Electric Power Board. Transformers. (B.X. 4801.)*

Christchurch.—November 24th. City Council. Pump, electric motor, valves, and automatic flow recorder. (A.X. 7006.)*

Rochdale.—November 17th. Electricity Department. One 12,000-kVA transformer with boosting transformers and switchgear. (October 12th.)

October 31st. Wiring for a period of 12 months. Engineer and manager, Electricity Works, Dane Street.

South Africa.—Johannesburg.—November 1st. Town Council. Six induction voltage regulators. (B.X. 4768.)* Transformers. (B.X. 4783.)* Truck-type switchboard cubicles. (B.X. 4782.)* 1,500 pairs of ironclad cut-outs. (B.X. 4795.)*

December 13th. Department of Posts and Telegraphs. Solder, copper wire and cable. (B.X. 4799.)*

South African Railways and Harbours. December 13th. One 7-ton electrical overhead travelling crane. (A.X. 6989.)*

Stoke-on-Trent.—November 14th. Electricity Department. Overhead wiring services for 64 new houses, Sutton estate, Trent Vale. City Electrical Engineer (£2).

Turkey.—Angora.—October 30th. Direction Générale des Chemin de fer et Ports d'Etat. Overhead electric travelling crane. (A.X. 6954.)*

*Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Contracts Closed.

Ashford (Kent).—Urban Council. Accepted :—
Installing electrical heating at the Assembly Rooms (£227).—Dowling & Primavesi.

Colchester.—Electricity Committee. Accepted:—
300-kVA transformer (£280).—English Electric Co., Ltd.
Three feeder panels and one truck-type cubicle (£827).—Electric Construction Co., Ltd.

Egypt.—Cairo.—*Alexandria Trunk Cable.*—With further reference to the note on p. 610 of the Electrical Review of October 12th, *Reuter's Trade Service* Cairo correspondent understands that the Pirelli-General Cable Works, Ltd., will be awarded the contract for the supply and laying of a straight-loaded trunk cable between Cairo and Alexandria. This company submitted several alternative prices, and the price at which the contract is being awarded has so far been unobtainable.

We are informed by the Kabelfabrik und Drahtindustrie A.G., of Vienna, that they also tendered for this contract in addition to the companies mentioned in our issue of October 12th.

Glasgow.—The Corporation Tramways Committee last week endorsed a recommendation to accept an offer from a German firm to supply tramway trolley wire. The German quotation was £1,106, against the lowest British offer of £1,262. An amendment that the lowest British offers should be accepted was defeated by 13 votes to 8.

Electricity Committee. Recommended :—
Cables in connection with the standardisation of frequency.—Callender's Cable and Construction Co., Ltd.; Power and Lighting Cables, Ltd.

Lighting Committee. Recommended :—
30,000 yd. twin core conductor (£1,500).—General Electric Co., Ltd. 30,000 yd. (£1,822).—Craigpark Electric Cable Co., Ltd.

Tramways Committee. Recommended :—
Tram rails.—Bolckow, Vaughan & Co., Ltd.
Armature coils.—P. R. Jackson & Co., Ltd.
Armature binding wire.—Bruntons, Ltd.

Government Contracts.—The following contracts were placed by Government Departments during September, 1928 :—

Admiralty Contract and Purchase Department.
Electrically-driven blowers.—Electro Dynamic Construction Co., Ltd.
Electric mining cable.—Siemens Bros. & Co., Ltd.
Electric cable installation.—G. E. Taylor & Co.
Cells.—Fuller Accumulator Co. (1926), Ltd.
Air compressors.—Browett, Lindley & Co., Ltd.
Electric lighting fittings.—W. McGeoch & Co., Ltd.
Telemotor operating gear.—MacTaggart, Scott & Co., Ltd.

War Office.
Submarine electric cable.—Siemens Bros. & Co., Ltd.
Generating set.—Davey, Paxman & Co., Ltd.
Electric meters.—Measurement, Ltd.; General Electric Co., Ltd.; Ferranti, Ltd.
Motor starters.—Electric Construction Co., Ltd.

Air Ministry.
Stand-by generating set (Filton).—Parsons Oil Engine Co., Ltd.
Cable joint boxes.—Hackbridge Cable Co., Ltd.
Generator controls.—H. W. Sullivan, Ltd.
Remote controls.—A. W. Hart & Co.
Hand-driven generators.—M.L. Magneto Syndicate, Ltd.; Mortley, Sprague & Co.
Generating sets.—Tangyes, Ltd.
Receivers and sounders.—H. W. Sullivan, Ltd.
Transmitters.—Gambrell Bros.
W./t. valves.—A. C. Cossor, Ltd.

Post Office.
Manufacture, supply, drawing-in and jointing cable.—London-Maidenhead: Pirelli-General Cable Works, Ltd. Wigan-Bolton: British Insulated Cables, Ltd. Nottingham-Loughborough: W. T. Henley's Telegraph Works Co., Ltd. Sheffield-Chesterfield: Standard Telephones & Cables, Ltd. Epping-Bishop's Stortford: Johnson & Phillips, Ltd. Leicester-Market Harborough: Callender's Cable & Construction Co., Ltd. Birmingham-Nuneaton: Siemens Bros. & Co., Ltd.
Manufacture, supply, laying and jointing submarine cables.—Anglo-Irish (Port Erin-Ballyhornan section): Siemens Bros. & Co., Ltd.
Telephone exchange equipment.—Manchester and Blackfriars (Manchester): Automatic Telephone Mfg. Co., Ltd. Sub-contractors: Crompton Parkinson, Ltd., for charging machines; Newton Bros. (Derby), Ltd., for ringing machines; Ruston & Hornsby, Ltd., for oil engine; Alton Battery Co., Ltd., for batteries. Skegness: Automatic Telephone Mfg. Co., Ltd.
Miscellaneous apparatus.—Automatic Telephone Mfg. Co., Ltd.; Phœnix Telephone & Electric Works, Ltd.; Siemens Bros. & Co., Ltd.
Telegraphic apparatus.—Creed & Co., Ltd.; Standard Telephones & Cables, Ltd.
Telephone apparatus.—Automatic Telephone Mfg. Co., Ltd.; General Electric Co., Ltd.; International Electric Co., Ltd.; Telephone Mfg. Co., Ltd.
Wireless apparatus.—Marconi's Wireless Telegraph Co., Ltd.
Battery stores.—Alton Battery Co., Ltd.; General Electric Co., Ltd. Siemens Bros. & Co., Ltd.; C. A. Vandervell & Co., Ltd.
Cable.—British Insulated Cables, Ltd.; Callender's Cable and Construction Co., Ltd.; Connollys (Blackley), Ltd.; Enfield Cable Works, Ltd.; W. T. Glover and Co., Ltd.; W. T. Henley's Telegraph Works Co., Ltd.; Johnson & Phillips, Ltd.; Pirelli-General Cable Works, Ltd.; Siemens Bros. & Co., Ltd.; Standard Telephones & Cables, Ltd.; Union Cable Co., Ltd.
Joint-box castings.—United Steel Companies, Ltd. (T. Butlin & Co.).
Loading coils.—Siemens Bros. & Co., Ltd.; General Electric Co., Ltd.
Telephones.—British Insulated Cables, Ltd.; Reliance Electrical Wire Co., Ltd.; Standard Telephones and Cables, Ltd.
Electrical fittings.—Revo Electric Co., Ltd.
Electric lamps.—General Electric Co., Ltd.; Edison Swan Electric Co., Ltd.
Electric motors.—Bull Motors, Ltd.; W. Jones & Co.
Repair of thermionic valves.—Standard Telephones and Cables, Ltd.

Crown Agents for the Colonies.
Alternators.—General Electric Co., Ltd.
Cables.—Callender's Cable & Construction Co., Ltd.; Siemens Bros. & Co., Ltd.
Diesel engine spares.—Mirrlees, Bickerton & Day, Ltd.
Electrical plant.—Fraser & Chalmers Engineering Works.
Electricity meters.—Ferranti, Ltd.
Spares for Lux cells.—Chloride Electrical Storage Co., Ltd.
Switchgear.—British Thomson-Houston Co., Ltd.
Telephone line materials.—J. Buller, Ltd.
Train-lighting spares.—J. Stone & Co.

Grimsby.—Electricity Committee. Recommended:—
Electric vehicle (£495).—Electricars, Ltd.
Cable for 12 months.—Greenwich Cable Works (£4,318); Johnson & Phillips, Ltd. (£4,569).
Troughing, &c., for 12 months (£858).—Astin & Co.

Irish Free State.—Dublin.—Department of Posts and Telegraphs.
Telephone cabinets.—T. R. Scott & Co., Dublin.
Cable (P.C.T.).—Siemens-Schuckert (Ireland), Ltd.
Cable terminals.—Cook Electric Co., Ltd.
Condensers.—General Electric Co., Ltd.
Indicators.—Ericsson Telephones, Ltd.
Insulators.—F. Routledge.
Gasfilled lamps.—Siemens-Schuckert (Ireland), Ltd.
Radio valves.—Standard Telephones & Cables, Ltd.
Bronze wire.—Siemens-Schuckert (Ireland), Ltd.
—*Irish Electrician.*

London.—Stoke Newington.—Electricity Committee. Recommended :—
Cables for 12 months.—Greenwich Cable Works, Ltd.
Quarterly meters for 12 months.—Reason Manufacturing Co., Ltd.
Prepayment meters for 12 months.—Measurement, Ltd.
Installation work under assisted wiring scheme, West Wimbledon Electric Services for installations wired in steel tube, and B. Winters & Son for installations with lead-covered wire.

Stepney.—Electricity Committee.
50 tons pitch (£140).—Gas Light and Coke Co.
3 tons plumber's solder and ½ ton tinman's solder (£296).—H. B. Barnard & Sons.
River-water screening plant (£2,889).—F. W. Brackett and Co., Ltd.

Islington.—Works Committee. Recommended:—
Two batteries for electric vehicles (£353, less £70 for old batteries).—D.P. Battery Co., Ltd.

London County Council.—Electric light installation at Radford House and Hartnoll House, Ring Cross Estate:—

Alpha Manufacturing & Electrical Co., Ltd. (Accepted.)	£1,023
"Rhymos" Electrical Engineers	1,045
Barlow Bros. & Co.	1,111
Electrical Installations, Ltd.	1,134
Alex. Hawkins & Sons	1,157
Anderson, Angell & Co.	1,244
A. Higginbotham & Sons	1,245
Smethurst & Co. (London), Ltd.	1,320
W. Davey	2,538

Hammersmith.—Electricity Committee. Accepted:—
Cable for electricity supply to the courtyards and staircases of the Peabody (Cleverly) Estate, Sawley Road (£224).—Greenwich Cable Works, Ltd.

South Africa.—Cape Town.—Electricity Committee. Recommended:—
Two 1,250-kW motor convertors (£5,138).—Bruce Peebles and Co., Ltd.
One 1,250-kW motor convertor (£2,900).—English Electric Co., Ltd.
55-h.p. electric motor and switchgear (£297).—Metropolitan-Vickers Export Co., Ltd.
Cable for southern suburb extensions.—Siemens Bros. and Co., Ltd. (£4,667); Netherlands Cable Co. (£9,674); British General Electric Co., Ltd. (£431).

Southend-on-Sea.—Town Council. Accepted:—
Five-ton hand power crane for Thorpe Bay sub-station.—H. Morris, Ltd.
Installation of Pearson automatic fire alarms, Prittlewell Priory.—Associated Fire Alarms, Ltd.
Cables for a year.—Union Cable Co., Ltd. (£13,546, approximately).
Cable for rotaries (£644).—Pirelli-General Cable Works, Ltd.
Police and fire alarms (£315).—Standard Telephones and Cables, Ltd.

Stoke-on-Trent.—Stores Committee. Accepted:—
Electric lamps for 12 months.—Robinson & Hands; Blackburn, Starling & Co.; Welsbach Light Co., Ltd.; J. V. Brittain & Co., Ltd.; Barnett & Soans.

Forthcoming Events.

Institution of Electrical Engineers (Informal Meeting).—Monday, October 29th. Institution, Victoria Embankment, W.C. 7 p.m. Discussion on "Our Profession from a Manufacturer's Point of View," to be opened by the President.

(South-Midland Centre).—Thursday, November 1st. Joint meeting with the Electrical Association of Women. Municipal Technical College, Birmingham. 7 p.m. Faraday Lecture. "Electricity in the Service of Man." Dr. S. Z. de Ferranti, F.R.S.

(North-Midland Centre).—Tuesday, October 30th. Hotel Metropole, King Street, Leeds. 7 p.m. Address by the chairman, Mr. F. S. G. Hinings.

(North-Western Centre).—Tuesday, October 30th. Midland Hotel, Manchester. 7.30 p.m. Address by the chairman, Mr. J. Harcourt Williams.

(London Students' Section).—Friday, October 26th. Institution, Victoria Embankment, W.C. 6.15 p.m. "Ignition Systems in Automobiles." Prof. S. Parker Smith.

(North-Eastern Centre, Students' Section).—Friday, October 26th. Armstrong College, Newcastle-on-Tyne. 7.15 p.m. "Post Office Telephones and the Public." Mr. L. B. Harmer.

Physical Society.—Friday, October 26th. Imperial College of Science, South Kensington, S.W. 5 p.m. Ordinary meeting.

Birmingham Electric Club.—Friday, October 26th. Grand Hotel. 7 p.m. "The Singing Arc." Prof. W. Cramp.

Junior Institution of Engineers.—Friday, October 26th. 39, Victoria Street. 7.30 p.m. "Legal Protection for Originality and Invention," by Mr. G. W. Tookey.
Friday, November 2nd. Kinematograph film, "The Babcock Boiler."

Salford Technical and Engineering Association.—Saturday, October 27th. Royal Technical College. 7 p.m. Short papers by members.

Nottingham Society of Engineers.—Monday, October 29th. Victoria Station Hotel. 7.30 p.m. "Manufacture of Water-Tube and Lancashire Boilers." Mr. H. E. Partridge.

Royal Institution of Great Britain.—Tuesday, October 30th. 21, Albemarle Street, W. 5.15 p.m. Tyndall Lecture, "Co-aggregation *versus* Continuity in the Change of State from Liquid to Vapour." Prof. H. L. Callendar.

Faraday Society and Electroplaters' and Depositors' Technical Society.—Wednesday, October 31st. Northampton Polytechnic Institute, St. John Street, E.C. Joint meeting.

Institution of Engineering Inspection.—Friday, November 2nd. Royal Society of Arts, John Street, Adelphi, W.C. 5 p.m. "Die Casting." Mr. A. H. Mundey.

Engineering and Scientific Club, Wolverhampton.—Friday, November 2nd. 7 p.m. "The Making of a High-Pressure Steam Boiler." Major S. J. Thompson.

The "Electrical Review" Service Department.

Inquiries must be accompanied by a stamped addressed envelope.

We should be glad to learn the names and addresses of makers of the following:—

Cox's patent billiard table fitting.
Birom vacuum cleaners.
Clasco automobile bulbs.
Small rotary convertors for operation off a.c. or d.c. mains (100 to 230 volts) giving an output of about 70 watts, 8-12 volts.
M.G. circuit breakers.

Notes.

E.A.W. Activities.

The first of the evening lectures of the Electrical Association for Women, on "Electric Light in Factories as it Affects Production and Hygiene," was given, in the absence of Mr. W. J. Jones, by Mr. Lingard, at the E.L.M.A. Lighting Service Bureau, London, on October 15th. The next lecture will be given at the Bureau on October 30th, at 7 p.m., by Miss Gladys Burlton.

A new Hampshire Branch of the Association is to be formed, and the inaugural meeting will be held at the "Annie Yorke" Memorial Hall, Southampton, on October 29th, at 3 p.m. The Dowager Lady Swaythling will take the chair.

The Cheltenham branch of the Association held a discussion on the Electrical "Outlet" Campaign of the Association on October 12th, when Mrs. Atwell was in the chair. Mr. W. J. Bache (Cheltenham) said that the campaign was viewed with favour by the supply authorities.

Fatality.

A verdict of "accidental death" was returned at an inquest at Wolverhampton on October 19th, on James Swaine (33), a tube screwer, who met with a fatal accident on October 17th while at work at Messrs. Edwin Lewis and Sons, Ltd., where the factory is being dismantled. Swaine went up a ladder to move some pulley blocks, and then sat on a beam. In order to move himself along the beam, he caught hold of two live electric wires. The jury added a rider that the firm ought to have warned the workman, and that the wires ought to have been properly guarded.

A Tangible Asset?

Charles Stewart Jarvis, electrician, Dundee, was charged at the local Sheriff Court on October 15th with having, between April 2nd and June 24th, broken into the premises at Dundee occupied by a joiner, and there stolen one unit of electricity. A plea of "not guilty" was tendered, and the trial was fixed for November 9th.

E.P.E.A. (Kent Section) Annual Dinner.

The ninth annual dinner of the Kent Section of the Electrical Power Engineers' Association is to be held on Saturday, November 24th, at 5.30 for 6 p.m. at the Royal Star Hotel, Maidstone. Mr. E. E. Hoadley, M.I.E.E., the borough electrical engineer of Maidstone, will preside. Tickets, 5s. 6d. each, may be obtained from the hon. secretary of the Section, Mr. S. J. Driver, 92, London Road, Maidstone.

Institution of Heating and Ventilating Engineers.

The 1928-29 session of the Institution of Heating and Ventilating Engineers opened on October 9th with a special paper by Dr. H. M. Vernon on "Methods of Heating and Ven-

tilating Schools and their Influence on Health." Other papers for the first part of the session include "Heating and Domestic Installations—the Insurance Point of View," by Mr. G. A. Cottell (November 7th); "Constant Pressure Thermal Storage," by Mr. Stanley Hopkins (December 5th); and "Economic Application of Electricity to Low-Temperature Heating Purposes," by Mr. George Wilkinson, M.I.E.E. (January 2nd). Full programmes of papers and visits have been arranged for the London and District and Manchester and District associate members and graduates branches.

Imperial Communications.

The London County Council has exchanged a contract with the Eastern Telegraph Company for the sale, at a price of £310,000, of the building on the Victoria Embankment formerly occupied as the head offices of the old London School Board, and subsequently as offices of the L.C.C. Tramway Department. The premises, when reconstructed, will be occupied as the offices of the new merger company for Empire radio and submarine cable telegraph communication.

The Exhibition of Inventions.

At the International Exhibition of Inventions, which was held at the Central Hall, Westminster, last week, under the auspices of the Institute of Patentees, were a few items of electrical interest. Messrs. J. A. Broow, who were proud of the fact that they had been awarded diplomas of merit in both 1927 and 1928, showed a range of lamp locks for, it is claimed, every type of bayonet-cap lampholder on the market. The "Klip-lamplock" for use with bakelite holders is merely a semicircular band spring which is sprung round the holder and clipped into the lamp-pin slots by means of projecting ends on the band. Another interesting exhibit by Messrs. Brook was an automobile dashboard "Super Sparker," which indicates while running whether a fault is on the sparking plugs, the magneto, or the carburettor. The Davies Manufacturing Co. showed the "Solectron" day and night electric sign, which is designed to serve as an ordinary daylight sign and when artificially lighted to illuminate both the sign proper and the shop window or area at the back. The "Swift" automatic electric copper and wringer was also shown by this company. This apparatus can be used as an ordinary wash tub; it is designed to prevent boiling over; and the wringer is secured to the top of the boiler. It has a maximum loading of 2,400 W. Messrs. A. W. Beuttell, Ltd., showed some applications of their "K-Ray" system of lighting display cases. The system employs a curved window to the showcase, the inside concave surface of which is used to reflect the light over the desired surfaces. Messrs. Tellus Super Vacuum Cleaner, Ltd., had on show several models of their "Tellus" electric cleaner. This is of the "fixed-body" type, the container and motor unit being of cylindrical construction, and standing vertically on the floor. Messrs. F. G. Knapton & Co. exhibited their "Dual-Purpose" Lamp, which is designed to serve either as an electric reading lamp or as a bowl fire. A specially designed holder serves for both the lamp and the element. The St. James' Electrical Co. showed an electric bell which operates directly on ordinary supply mains without the use of a relay or transformer. "Flinso" is a patent tinning compound which was demonstrated on the stand of Messrs. Grant & West, Ltd.; very dirty surfaces were effectively tinned by the mere application, without cleaning, of heat and the compound. The Post Office Telephone Service demonstrated the working of the automatic telephone system by means of a model installation.

Appointments Vacant.

Assistant exchange engineer (£E600). Two exchange electricians for the Egyptian Government Telegraph and Telephone Department. Meter tester for the Radcliffe U.D.C. Electricity Department. Mains assistant and meter-room assistant for the Wolverhampton Corporation Electricity Department. Borough electrical engineer for the Harwich Corporation Electricity Undertaking. Engineer and manager for the Hong Kong Electric Co., Ltd. Assistant electrical engineer for the Indian State Railways. Installation inspector (77s. 3d.) for the Colchester Corporation Electricity Department. Mechanical fitters for the Bingley U.D.C. Electricity Department. (See our advertisement pages to-day.)

High-Frequency Phenomena.

An unusual phenomenon is referred to in the current issue of the house organ of Messrs. Marryat & Place, whose Mr. T. W. Shaw, in an article headed "The Futility of 'Earthing' as a Safety Precaution Against Electric Shocks," states that they received an inquiry from a firm of structural-steel engineers for an insulated crane hook to carry a load of five tons. Before quoting, he says, they interviewed the firm and were informed that the hook was required to be insulated in some way to prevent workmen handling the load lifted by the crane from receiving electric shocks. Their engineer pointed out that, while it would be possible to supply an insulated hook, the best precaution, in his opinion, would be to earth the crane properly in accordance with the I.E.E. rules. He was informed that the earth bonding had been properly carried out, but that severe shocks were being received by the workmen, due to the British Broadcasting Corporation's transmission from 2LO. The engineer was invited to investigate the matter, and Mr. Shaw states that to determine the nature of the current charge in the crane rope a neon tube 2 ft. 6 in. long was used and brilliantly lit when held in the hand close to the crane hook. The crane structure as a whole was earthed. In order to ensure that there was no open circuit or high-resistance joint in the earthing a pair of cables was run up the mast, their lower end being connected by a separate lead to the steel building framework, a lead water pipe with running water, and a copper earth pin buried 2 ft. in waterlogged ground. With the crane hook 16 ft. from the mast the voltmeter registered 320 V, and when the crane was rotated 90 degrees the voltmeter reading was off the scale (over 350 volts). Petrol was set alight by earthing the outside of a tin containing the petrol and touching inside with a lead from the crane hook; a safety match was lit by touching the crane hook to earth above the match head; a hemp sling was scorched and set alight by a wire brought close to the charged hook with a strand of sling.

Mr. Shaw adds:—"It is evident that buildings in the vicinity of wireless transmitting stations carry unsuspected high oscillatory electric currents of some magnitude, and, if currents to anything like the value we have shown exist on other sites, the possible risk of fire due to the emanation of free gases, the electrolytic disruption of gas, water, and electric mains forming part of a closed circuit, and the possibility of the deterioration of bolts and rivets in the steel circuit should have due consideration."

An official of the B.B.C. states, according to *The Times*, that there is absolutely no danger to flat or house dwellers in the vicinity of the Oxford Street transmitter, nor is there any danger of serious injury to the workmen on the crane. "The mass of metal in the crane, plus the length of cable employed, in effect acts as a receiving aerial which absorbs some of the energy from the transmitter. The circuit of the crane containing the 320 volts, if connected to earth through a human body, falls at once to zero, resulting in a pin-prick to the person concerned. . . . The amount of power in the circuit is infinitesimal."

A Faraday Memorial Library at Southwark.

A bust of Michael Faraday, presented to the Southwark Borough Council by the Institution of Electrical Engineers, was unveiled at the Central Library, Walworth Road, on October 17th, by Lt.-Col. Kenelm Edgcumbe, president of the Institution. The room is set apart for a Faraday Memorial collection, and on October 28th last year Sir Oliver Lodge unveiled a memorial tablet on which is inscribed the life and work of Faraday. Lt.-Col. Edgcumbe, in briefly outlining the life of Faraday, said that he was first employed by a bookseller and binder, which enabled him to read and gave him an insatiable thirst for knowledge—especially scientific knowledge. At the age of 22 he was appointed assistant to Sir Humphrey Davy at the Royal Institution, where he was a professor until his death. It was now about 100 years since he commenced a series of experiments, the results of which formed the basis of the whole of modern electrical engineering, and without which we should not have had electric light, tube railways, or wireless. He had a marvellous intuitive gift of knowing which of his results were worth following up and which he could lay aside as of no use. Mr. Sydney Evershed said these words not long ago: "Faraday in his researches never seemed to lose his way. It was almost as though Nature herself was leading him by the hand." The more Faraday unravelled Nature's secrets, the more he felt that there was somewhere beyond and above it all, a directing force which was inscrutable even to his great mind. He was one of the greatest of those who made the name of England great.

Centenary of King's College, London.

During the present academic year King's College, University of London, will celebrate the hundredth anniversary of its foundation. Before the war the full-time day students in attendance at the College numbered about 700; to-day there are more than 1,200 undergraduate students in the six faculties; over 300 post-graduate students are reading for higher degrees or are engaged in research work; and some 500 students are reading for degrees and diplomas in the Evening Department. An important development since 1913 has been the scheme of free public lectures, by means of which the latest discoveries in science and learning have been made accessible to large popular audiences. Of a total annual expenditure of over £130,000, not more than £4,800 is at present derived from endowments. An appeal is being made for a total sum of £350,000. Of this, £125,000 is required for new buildings for science and medicine; £125,000 for the endowment of Chairs of English, Physics, Physical Chemistry, Electrical Engineering, and Physiology, and £60,000 for scholarships and bursaries.

Donations can be sent to one of the treasurers, Mr. Reginald McKenna or Sir Edward Troup, K.C.B., K.C.V.O., at King's College, Strand, W.C.2, or to the College bankers, Messrs. Coutts & Co., at 440, Strand, W.C.2, for the credit of King's College Centenary Appeal Account.

Electricity Charges in South London.

The daily Press reports that an ultimatum has been sent to the County of London Electric Supply Co., Ltd., by the South London Chambers of Commerce and Ratepayers' Associations, which were instrumental in obtaining a Ministry of Transport inquiry into the charges made for electricity in Wandsworth, Clapham, Putney, Streatham, and other large South London areas supplied by the company. The inquiry was adjourned to allow of a conference between the company,

the Wandsworth Borough Council, and the representatives of the protesting consumers. Four specific points were raised by the Wandsworth Council and the consumers at the conference, and the company agreed to consider them, and to reply by letter. More than three months having elapsed since the conference, and no reply having been received, the consumers sent a letter to the company asking for an immediate reply, and unanimously resolved, if a reply was not immediately forthcoming, to apply to the Ministry of Transport to resume the adjourned inquiry. The company has replied stating that the letter will have immediate attention.

Manchester Radio Exhibition.

Mrs. Philip Snowden, a member of the Board of the British Broadcasting Corporation, opened the *Evening Chronicle* Radio Exhibition in the City Hall, Manchester, on October 22nd. The speeches made at the ceremony were broadcast, and the Radio Manufacturers' Association took part officially in the show, the first time it has done so in the case of a provincial display. Features of the exhibition were a demonstration of picture broadcasting by wireless transmission (the Fultograph photo-telegraph system) and the provision of a common amplifier by means of which exhibitors were able to demonstrate their apparatus. The display of the Marconiphone Co., Ltd., was substantially the same as that on show at Olympia. Much on the same lines also was the exhibit of Metro-Vick Supplies, Ltd., whose blue and silver stand with illuminated coloured glass panels was brilliantly floodlighted.

Institution Notes.

Institution of Electrical Engineers.

South-Midland Centre.—The annual dinner of the Centre will be held at the Grand Hotel, Birmingham, on Friday, November 30th. There will only be two toasts, the speakers being: Lt.-Col. K. Edgcumbe, T.D., R.E.T. (ret.), president I.E.E., Mr. F. Hodges, Central Electricity Board, Sir Gilbert C. Vyle, K.B.E., and the Bishop of Birmingham. The dinner will be followed by a re-union.

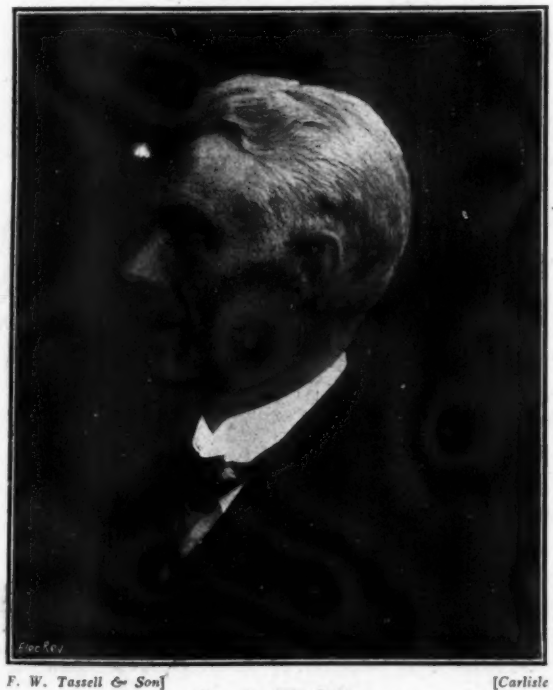
Junior Institution of Engineers.

In a lecture delivered on Friday, October 19th, 1928, Mr. R. H. Sharp dealt with the question of advertising engineering products, and from his experience as an advertising consultant stated that, while a great advance had taken place of recent years in the advertising of general commodities, the advertising of technical and engineering products had remained almost stationary. The causes for this were that technical advertising was seldom so effective in so far as results were concerned as general advertising; its importance was often not realised, and the man who handled this department in an engineering firm was a technician first and an advertising man second; and that no really good advertising agency had ever been invited to take over the whole of the advertising arrangements.

Our Personal Column.

Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements.

Mr. Charles William Salt, M.I.E.E., who delivered his address as chairman of the North-Eastern Centre of the Institution of Electrical Engineers at Newcastle-on-Tyne on Monday evening last, is the city electrical engineer of Carlisle. He was born in 1878, and educated at King's College, the North-



F. W. Tassell & Son [*Carlisle*

Mr. C. W. Salt,

Chairman of the North-Eastern Centre of the I.E.E.

ampton Institute, and Birmingham Technical Institute. His career has been mainly spent in the electricity supply branch of the industry, in which connection he has held important positions with the Croydon, Bradford and Torquay municipal electricity undertakings. He was borough electrical engineer at Torquay from 1910 to 1915, and has been city electrical engineer at Carlisle since the year 1919. Mr. Salt has had a good deal of experience with electricity works extensions and the reorganisation of mains systems and generating stations. His latest work has been the design and carrying out of a new power station at Carlisle, which has been selected as a base load station by the Commissioners in the North-West England and North Wales Scheme, 1928.

Mr. H. F. Hudson writes to point out that he has been appointed meter superintendent at Worcester and not Torquay, as stated in our last issue.

Mr. H. M. Pease has relinquished the position of managing director of Standard Telephones and Cables, Ltd., due to the pressure of work occasioned by his position as vice-president and general manager in Europe of the International Standard Electric Corporation. Mr. Frank Gill has been appointed chairman of the Board and Mr. E. S. Byng managing director of Standard Telephones and Cables, Ltd.

Mr. J. B. E. Dahlerus, managing director of Electrolux, Ltd., who has resigned to become director of Ruths' Steam Accumulators, Ltd., in Sweden, has been presented with a clock by the staff at Luton and branches.

The marriage took place at Eccles on October 17th of Mr. Alfred Stubbs, B.Sc., A.M.I.E.E., A.M.I.M.E., of the Metropolitan-Vickers Electrical Co., Ltd., and Miss Agnes G. Smiley, M.B., of Pendleton.

The marriage took place recently at Tunbridge Wells, of Mr. Charles W. Mittins, of the construction department of the British Thomson-Houston Co., Ltd., Rugby, and Miss Winifred Thomas, of Tunbridge Wells.

Mr. J. L. Campbell, late of the Manchester office of the Hotpoint Co., has now taken up duties with the Manchester office of the Credenda Conduits Co., Ltd.

Mr. J. A. Sloane, late of the Metro-Vick Co. and Messrs. Siemens, has joined the outside staff of the Hotpoint Electric Appliance Co., Ltd., 99, Corporation Street, Manchester.

Mr. John H. Sandiford, A.M.I.E.E., has joined the switchgear sales department of the English Electric Co., Ltd.

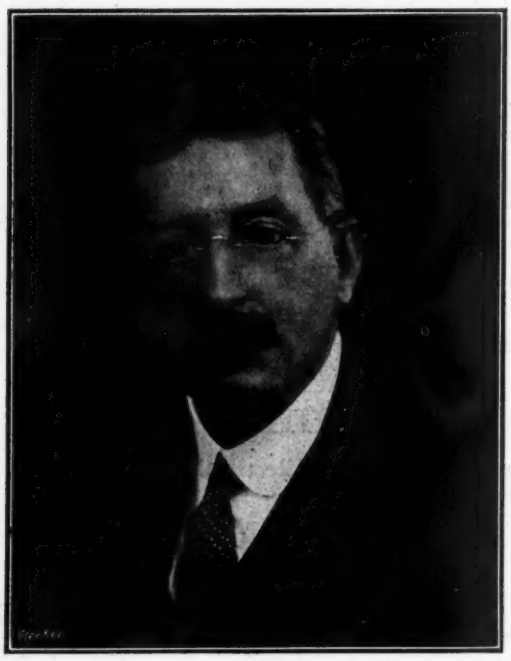
Alderman Albert Wilkinson, who has accepted the mayoralty of Luton for the fourth year, has for 32 years been chairman of the Corporation Electricity Committee, and is a member of the National Joint Council and Board, and chairman of No. 9 Area Council (South-Eastern England) for the Electricity Supply Industry.

The Glasgow Corporation Special Sub-Committee on Reorganisation of the Electricity Department recommends that Mr. John Simpson, chief clerk, be appointed secretary and treasurer at a minimum salary of £750 per annum, and that the minimum and maximum salaries applicable to the position be fixed at £750 per annum, rising by biennial increments of £50 to £1,000 per annum, and that no appointment be made to the position of chief clerk.

The Glasgow Corporation Electricity Manager has promoted Mr. William A. Legge, second assistant mains superintendent, Western District, to the position of first assistant mains superintendent, Central District, at a wage of £7 19s. 11d. per week.

The new chairman of the Mersey and North Wales (Liverpool) Centre of the Institution of Electrical Engineers is Mr. S. E. Britton, whose portrait appears herewith. Mr. Britton's career commenced in 1890 with Messrs. Crompton & Co., Chelmsford, with whom he stayed five years. He later became chief assistant electrical engineer at Southampton during the

construction of the Back of the Walls generating station and the electrification and extension of the tramways. Subsequently he acted as engineer and manager of the Barking Council's undertaking. His next appointment was as chief engineer and manager of the Motherwell undertaking, in which capacity he supervised the completion of the station and distributing system and carried out important extensions. Mr. Britton went to Chester in 1904 as engineer and manager of the city electricity department, and since that time has done a great deal of important work in the district. He was responsible for the design and construction of the city's hydro-electric



C. H. Lodge] *[Chester.*

Mr. S. E. Britton,

Chairman of the Mersey and North Wales (Liverpool) Centre of the I.E.E.

works; the purchase of the Queensferry power station; and the construction of 33,000-V and 6,600-V transmission lines. To him was due the development of the rural electrification scheme around Chester, and he prepared plans for the development of 50 miles of the River Dee for the generation of electricity by water power and the rural electrification of the adjoining area. He gave valuable evidence before the Water Power Resources Committee of the Board of Trade. One of the first schemes considered by the Electricity Commissioners under the 1919 Electricity (Supply) Act was that drawn up by Mr. Britton for the North Wales and Chester area. His work on behalf of the I.M.E.A. is well known; he has served on the Council of the Association for many years, and was president in 1923-24. Among his latest activities is his representation of the I.M.E.A. on the Electricity Commissioners' Conference on Electricity Supply in Rural Areas. Mr. Britton delivered his address as chairman of the Centre on Monday last; it is referred to in our leader to-day.

The City of London Corporation recommends that the salary of Mr. A. Roberts, electrical engineer and inspector, who has been in the service of the Corporation for nearly 34 years, be increased from £659 per annum to £700, rising to a maximum of £850.

Mr. John S. Just, M.I.E.E., M.Am.I.E.E., M.I.E.Aust., has resigned his position as engineer and manager to the City Electric Light Co., Ltd., of Brisbane, after thirteen years association with the company. He has commenced practice professionally on his own account.

Mr. James R. Bisland, power station superintendent at the Paisley Corporation Electricity Works, was presented by the staff and employés with a floor standard on the occasion of his marriage. Mr. W. Blair Smith made the presentation.

Reports have been persistent for some days to the effect that Lord Birkenhead had ceased to be a member of the Government now instead of next June in order that he might become chairman of the merger concern embracing the Marconi and Cable Company interests, at £15,000 per annum. On Wednesday the Press stated that there was not a word of truth in the report.

Obituary.—Mr. N. Wright.—We regret to hear of the death, on October 13th, of Mr. N. Wright, public lighting engineer of Bournemouth, and president-elect of the Association of Public Lighting Engineers. He passed away after a short illness, the cause of death being para-typhoid and enteric. At the Sheffield Conference in July Mr. Wright was chosen as next year's president. He leaves a widow and six children to mourn his loss. The interment took place at Bournemouth Cemetery on the 17th inst. The Association was represented by Captain W. J. Liberty, hon. secretary, who placed a wreath at the graveside on behalf of the Council and the Association.

Mr. W. J. Thorrowgood.—The death occurred at Wimbledon on October 18th, at the age of 66 years, of Mr. William John Thorrowgood, late signal and telegraph superintendent of the Southern Railway.

Mr. F. Richardson.—We regret to learn that Mr. Frank Richardson, of the Enfield Cable Works, Ltd., Brimsdown, died on October 6th as the result of a motor accident. He was in the service of the above company for a number of years in the capacity of chief electrician; latterly he had assisted in the works management. A man with to all appearances a most promising career before him, his tragic end is felt very keenly by his many friends and associates.

Mr. H. Watson.—The death occurred suddenly, on October 5th, at the age of 66 years, of Mr. Herbert Watson, one of the senior partners in the firm of Watson & Sons, electricians, of 17, Birmingham Street, Oldbury.

Friends of the late Mr. C. Orme Bastian will learn with regret of the death of his mother, widow of Dr. H. Charlton Bastian, F.R.S., which occurred on October 15th at Fairfield, Chesham Bois.

Mr. F. Arnold.—The funeral took place on Tuesday last week of Mr. Frank Arnold, who was for many years a member of the accountancy staff of the City of Coventry Electricity Department.

Mr. F. R. Harrop.—The death occurred on October 12th of Mr. Frank Rigden Harrop, formerly on the staff at the power station at Chatham Dockyard as a shift engineer, a position which he relinquished to join the Technical School at Kingston-on-Thames as an assistant master in engineering. At the time of his death Mr. Harrop filled a similar position at the Darlington Technical School.

Wills.—The late Mr. Alfred Clough, formerly resident electrical engineer of Liverpool Corporation, left £4,432 net and £6,160 gross personalty.

The late Mr. E. C. R. Marks, of Birmingham, member of the firm of Marks & Clerk, left £35,539 net and £37,204 gross personalty.

Financial Section.

New Companies, Returns of Share Capital, Debenture Changes, Reports of Electrical Companies, Dividend Results, Transactions in Stocks and Shares.

New Companies Registered.

Ideal Home Electrical Appliances, Ltd.—Private company. Registered October 22nd. Capital, £2,000 in £1 shares. Objects:—To carry on the business of electricians, mechanical engineers and manufacturers, &c. The subscribers (each with one share) are:—F. W. Luker, 73, Alberta Road, Bush Hill Park, Enfield; and F. A. Rallings, 161, Willingdon Road, Wood Green, N.22, electrical engineers. Solicitors: Heald, Johnson & Co., 129, Wardour Street, W.1.

S. Hodgson & Co. (Halifax), Ltd.—Private company. Registered October 12th. Capital, £12,000 in £1 shares. Objects: To carry on the business of manufacturers and sellers of motors, dynamos, electrical and mechanical engineers, machine and engineering tool makers, &c., and to adopt an agreement with S. Hodgson. The first directors are:—S. Hodgson (permanent governing director), Woodville, Boulevards, Halifax, electrical engineer; C. O. Sutcliffe, 9, Lower Pond, Roils Head Road, Halifax, electrical engineer. Registered office: High Level Electrical Works, Halifax.

Leo Taylor, Ltd.—Private company. Registered October 15th. Capital, £1,000 in £1 shares (500 7 per cent. cumulative preference and 500 ordinary). Objects: To acquire the busi-

ness of a manufacturer of and dealer in wireless instruments, apparatus and accessories now carried on by J. L. Taylor, at 6, Kensington Road, Ansdell, Lytham. The permanent directors are:—J. L. Taylor, 6, Kensington Road, Ansdell, Lytham; A. Pogson, Stoneleigh, Eddington Road, Fairhaven, Lytham.

C. H. Sowerby, Ltd.—Private company. Registered October 13th. Capital, £100 in £1 shares. Objects: To carry on the business of wholesale dealers in and commission agents for electrical appliances and accessories, hardware and automobile accessories and fittings, &c. The directors are:—C. H. Sowerby, 58, Maldon Road, Acton, W.3; A. G. Watson, 6, Creffield Road, Ealing Common, W.5. Registered office: 22, Ely Place, Holborn Circus, E.C.1.

Auto Cyphers, Ltd.—Private company. Registered October 15th. Capital, £20,000 in £1 shares (10,000 "A" and 10,000 "B"). Objects: To carry on the business of manufacturers, importers and exporters of, dealers in and repairers of all kinds of machinery, apparatus and material for transmitting and/or receiving codes, &c., and/or for recording or reproducing printing type and other writing, pictures and sounds, &c., and to adopt an agreement with M. C. M. O'Brien and C. F. Gardner. The subscribers are:—E. J. Burrows, 29, Lyndhurst Road, Highams Park, E.4, and T. G. Greenleaf, 36, Sistova Road, Balham, S.W.12, solicitors' clerks. Solicitors: Herbert Smith & Co., 62, London Wall, E.C.

Motor, Electrical and General Trust, Ltd.—Private company. Registered October 12th. Capital, £100 in £1 shares. Objects: To acquire the business of advertising contractors and printers known as "The Preston Publicity Company"; and the controlling interest in Sphinx Electric Supplies (Ireland), Ltd., Coal By-Products, Ltd., and Electrovite, Ltd. The subscribers are:—C. P. Preston, 3, Gray's Inn Place, W.C., company director; A. H. Chavil, Peterbrook, Warstock, Birmingham, company director. Secretary: J. W. Beavis. Registered office: Sphinx House, 47, Hatton Garden, E.C.

Gramo-Radio, Ltd.—Private company. Registered October 15th. Capital, £3,000 in £1 shares. Objects: To carry on business as manufacturers of and dealers in wireless and television receiving and transmitting apparatus, mechanical and electrical gramophones, electrical accumulators, eliminators, &c. The first directors are:—J. Wilson, 32, St. James Road, Church, Lancs., engineer (permanent managing director and chairman); J. Barlow, Bank House, Blackburn Road, Antley, Accrington. Registered office: Commercial Works, Church, Lancs.

Wilson Manufacturing Co., Ltd.—Private company. Registered October 18th. Capital, £1,000 in £1 shares. Objects: To acquire the business of a wireless engineer, manufacturer of and wholesale and retail dealer in wireless and musical instruments and accessories carried on by J. R. Wilson at 30, Liverpool Road, Stoke-on-Trent. The directors are:—Mrs. Florence M. Wilson and J. R. Wilson, "Berwyn," Moss Pit, Stafford. Secretary: J. R. Wilson. Registered office: 30, Liverpool Road, Stoke-on-Trent.

Everlite, Ltd.—Public company. Registered October 16th. Capital, £100,000 in 1s. shares. Objects: To adopt an agreement with Metropole Developments, Ltd., and to carry on the business of electricians, manufacturers, engineers, suppliers of electricity for light, heat, motive power or otherwise, manufacturers of and dealers in electric lamps, radiators, dynamos and batteries, manufacturers of wireless or radio apparatus, &c. The subscribers (each with one share) are:—D. F. A. Shayler, 16, Bendemere Road, Putney, S.W.15, solicitor's clerk; R. C. Howley, 8, King Edward Road, Leyton, E.10, solicitor's clerk; and five others. Solicitors: Ashurst, Morris, Crisp & Co., 17, Throgmorton Avenue, E.C.2.

Recordaphones, Ltd. — Public company. Registered October 18th. Capital, £200,000 in 300,000 participating preferred shares of 10s. each and 1,000,000 deferred shares of 1s. each. Objects: To acquire a licence under British patents for the manufacture and sale of the electrical invention known as the "Recordaphone" within Great Britain and Northern Ireland and certain manufacturing and selling rights in respect of such invention throughout the British Empire, except Canada, to adopt an agreement with British Telegraphones, Ltd., and to carry on the business of manufacturers of and dealers in "Recordaphones," sound boxes, amplifiers, instruments, automatic machines, wireless and other devices and appliances, electricians, &c. The subscribers (each with one participating preference share) are:—F. J. Groombridge, 161, Winn's Avenue, Walthamstow, E.17, clerk; H. L. Armstrong, 6, Ritchings Avenue, Walthamstow, E.17, clerk; and five other clerks. Solicitors: Herbert Smith & Co., 62, London Wall, E.C.2.

Cranfurd & Frost (Wireless), Ltd.—Private company. Registered October 19th. Capital, £3,000 in 2,500 7 per cent. cumulative preferred ordinary shares of £1 each and 4,000 deferred ordinary shares of 2s. 6d. each. Objects: To carry on the business of manufacturers of and dealers in radio, telephone, telegraph, electrical, optical, surgical and scientific instruments and apparatus, &c. The permanent directors are:—Q. C. A. Cranfurd, North View, Lydd, Kent, captain R.N. (ret.), chairman; C. C. J. Frost, 32, Alma Road, Windsor, captain, I.A. (ret.). Solicitors: Kenneth E. Bartlett Elliott and Co., 83, Cannon Street, E.C.

Regal Radio, Ltd.—Private company. Registered October 19th. Capital, £300 in £1 shares. Objects: To carry on the business of electrical and wireless engineers, manufacturers of and dealers in and repairers of radio apparatus, amplifiers, aerials, &c. The permanent directors are:—J. Packer, 39, Atherley Road, Nunhead, S.E.18 (managing director); F. C. Boyle, 136, Malford Grove, Snaresbrook, E.18; and C. N. Cook, 23, The Ridgway, Old Southgate, N.14, radio manufacturers. Solicitor: J. M. Hawkins, 44, Bedford Row, W.C.

Ash Company (London), Ltd.—Private company. Registered October 19th. Capital, £750 in 1s. shares. Objects: To carry on the business of manufacturers and installers of and dealers in power plant and other engineering equipment of all kinds, &c. The directors are:—P. B. Silk (chairman and managing director), 7, Sussex Mansions, Maiden Lane, W.C.2; F. B. Allen, Pennsylvania, U.S.A.; L. P. Hoff, Pennsylvania, U.S.A.; J. Deutsch, New Jersey, U.S.A.; J. W. Lonsdale, 15, Northwick Terrace, St. John's Wood, N.W.8. Remuneration: 1s. per annum. Secretary: C. E. Cole. Registered office: 21, Wigmore Street, W.1.

Beam Gramophone Radio Co., Ltd.—Private company. Registered October 20th. Capital, £100 in 1s. shares. Objects: To carry on the business of manufacturers of and dealers in gramophones, wireless sets, television apparatus, gramophone records and needles, to purchase, rent or grant licences for broadcasting talking pictures and music, &c. The permanent directors are: F. M. H. Cooper, 3, Elm Road, East Sheen, Surrey; E. A. Hardman, 33, Paternoster Row, E.C. Solicitors: Attenboroughs, 15-16, Thavies Inn, W.C.1.

Haslam & Newton, Ltd.—Public company. Registered October 20th. Capital, £450,000 in 250,000 cumulative preference shares of £1 each and 1,000,000 ordinary shares of 4s. each. Objects: To adopt agreements (a) with the Haslam Foundry and Engineering Company (1927), Ltd., and (b) with Newton Brothers (Derby), Ltd., and to carry on the business of manufacturers of and dealers in machinery of all descriptions, internal combustion and other engines, mechanical, electrical, general, &c. engineers, boiler makers, electric light contractors, power engineers and fitters, tube and pipe manufacturers, manufacturers of and dealers in machinery, electric light and power plants, refrigerating and refrigerating plants, artificial silk, chemical and distillation plants, wireless stations, dynamos, motor vehicles, &c. The subscribers (each with one £1 share) are: G. W. Waspe, 325, Hertford Road, Waltham Cross, cashier; S. E. Penhallow, 112, Regent Street, W.1, clerk, and five other clerks. Solicitors: J. D. Langton and Passimore, 111, Old Broad Street, E.C.

Electro-Thermal Company.—Particulars of this company were filed on October 9th, pursuant to Section 274 of the Companies (Consolidation) Act. Incorporated in Ohio, U.S.A. British address, 3, Lower John Street, W.1, where C. H. McFarland is authorised to accept service of process and notices. Directors: W. J. Kirk, A. T. Howser and C. Stratford, all resident in the United States. (Particulars regarding capital, objects, &c., will be filed later.)

Official Returns of Electrical Companies.

Musselburgh and District Electric Light and Traction Co., Ltd.—Particulars filed of £30,000 debentures authorised by resolutions of August 21st and October 1st, 1928, charged on the company's property, present and future, including uncalled capital, the amount of the present issue being £7,000.

J. T. Kemp, Ltd.—C. Thompson, Commerce Chambers, Parliament Street, Nottingham, was appointed receiver on October 8th, 1928, under powers contained in debentures created September 23rd, 1927.

Premier Electric Welding Company (Newcastle), Ltd.—Mortgage on premises in Orchard Street, Whitefriars Place, and Hanover Street, Newcastle-on-Tyne, dated October 2nd, 1928, to secure all moneys due or to become due from the company to Lloyds Bank, Ltd., not exceeding £2,500.

Dorset and Devon Electricity Supply, Ltd.—F. P. Barnes, 24, Coleman Street, E.C.2, ceased to act as receiver or manager on October 5th, 1928.

Smith & Sturt, Ltd.—H. Brown, 71, Temple Row, Birmingham, was appointed receiver and manager on October 5th, 1928, under powers contained in first debenture dated December 2nd, 1927.

Midland Dynamo and Motor Repairs Co., Ltd.—Mortgage on freehold premises 18, 20 & 22, Orchard Street, and 9-17 (odd numbers), Royal East Street, Leicester, with fixtures, &c., dated October 6th, 1928, to secure all moneys due or to become due from the company to the National Provincial Bank, Ltd.

Continental Radio Import Co., Ltd.—Particulars filed of £1,000 debentures authorised October 4th, 1928, charged on the company's undertaking and property, present and future, including uncalled capital, the amount of the present issue being £500.

Courtin & Walsh, Ltd.—Debenture dated October 8th, 1928, to secure £2,500 charged on the company's undertaking and property, present and future, including uncalled capital. Holder: Mrs. I. Baxter, 74, Kingsfield Road, Watford.

Hightensite and Ebonite Manufacturing Co., Ltd.—Issue on September 19th, of £100, and on October 10th, 1928, of £1,000 debentures, parts of a series already registered.

British Arc Welding Co., Ltd.—Capital, £50,000 in £10 shares. Return dated August 23rd, 1928. 1,474 shares taken up. £12,740 paid. £2,000 considered as paid. Mortgages and charges nil.

A. F. Yarnold, Ltd.—Capital, £2,000 in 500 preference and 1,500 ordinary shares of £1 each. Return dated December 31st, 1927 (filed August 20th, 1928). 350 preference and 685 ordinary shares taken up. £1,035 paid. Mortgages and charges nil.

Richson & Co. (1925), Ltd.—Capital, £15,000 in £1 shares. Return dated July 24th, 1921. 14,660 shares taken up. £2 paid. £14,658 considered as paid. Mortgages and charges nil.

Battery Plates, Ltd.—Capital, £500 in £1 shares. Return dated March 14th (filed May 1st), 1928. 500 shares taken up. £500 paid. Mortgages and charges nil.

Geo. H. Scholes & Co., Ltd.—Capital, £8,000 in 5,000 preference and 3,000 ordinary shares of £1 each. Return dated August 30th, 1927 (filed May 25th, 1928). 2,386 preference and 2,002 ordinary shares taken up. £1,952 paid on 1,950 preference and 2 ordinary shares. £2,386 considered as paid on 386 preference and 2,000 ordinary shares. Mortgages and charges nil.

Excel Radio Units, Ltd.—Capital, £500 in £1 shares. Return dated August 10th, 1928. 301 shares taken up. £201 paid. £300 considered as paid. Mortgages and charges nil.

Bell Electrical Co. (Northern), Ltd.—Capital, £1,000 in £1 shares. Return dated August 31st, 1927 (filed July 18th, 1928). 753 shares taken up. £750 paid. £3 considered as paid. Mortgages and charges nil.

National Electric Construction Co., Ltd.—Capital, £125,000 in 10s. shares. Return dated June 7th, 1928. 170,000 shares taken up. £75,574 10s. paid. £9,425 10s. considered as paid. Mortgages and charges £75,000.

City Notes.

Ferranti, Ltd.

The annual meeting was held on October 18th, when Mr. S. Z. de Ferranti, F.R.S., D.Sc., chairman of the company, presided. In moving the adoption of the report and accounts, the chairman said that the turnover for the year was approximately the same as in the previous year, but the net profit increased by £18,634. Discount and interest showed a credit of £3,404 in 1926-27, whereas last year there was a debit of £380. That change was mainly due to the increased turnover in radio apparatus on which a cash discount was allowed for settlement at due dates. There had been an increase in the general establishment charges of £8,069, due to increased efforts to extend the company's business and to increases in certain overhead charges, such as rates and contributions to health and unemployment insurance. The total standing to the credit of the depreciation reserve account was £136,912, which was equal to more than one-third of the total value of the fixed assets of the company. The general reserve account now stood at £270,000. Leaving the accounts, the chairman said the best possible relations existed with their workpeople. That was a most vital matter in relation to the satisfactory conduct of a business such as theirs. He could only hope that that long state of goodwill would continue indefinitely.

In reply to a suggestion that the company should print the corresponding figures of last year so that they could be compared with the latest figures, the chairman said that the directors had considered it, and they had decided that they might carry out the suggestion when it had been adopted by the great financial companies. The board tried to deal with the accounts on the most conservative basis possible, for serious difficulties lay before manufacturing companies. They were open to attack from every part of the world, and they felt it very seriously. They were continually having markets closed to them, and business which was good one year might be entirely gone the next. They had only been able to keep the company in its present satisfactory condition by continually fighting for business. Competition had been most severe, and they felt it necessary to be extra conservative in husbanding their resources as much as possible, and seeing that their work was done in the most efficient way with the most perfectly equipped manufacturing plant. When they thought of the generally unsatisfactory state of trade in the country, however prosperous they might be at the moment, it was as well to adopt a cautious policy. The report and accounts were adopted.

Drake & Gorham, Ltd.

The net profit for the year ended June 30th last was £9,628, against £9,586 in 1926-27. To this is added £2,692 brought forward, making £12,320. It is proposed to pay a dividend of 5 per cent., to transfer £2,500 to reserve, and to carry forward £3,570. The report says that in spite of trade depression in the northern district, the profits of the contracting business have been maintained. To cope with the growing demand for h.p. sub-station switchgear the works have been reorganised. The sale of pumps and water softeners has improved, and there appears to be a large field for the latter. The company is obtaining an increasing number of contracts for the equipment of large buildings in course of construction, such as the new Bank of England and Lloyd's Bank head offices.

William Beardmore & Co., Ltd.

The committee which was appointed last year to investigate the company's affairs has recommended a thorough reorganisation. This involves the reduction of the capital by £2,509,112, to be accomplished by writing 1,875,224 £1 preference shares down to 10s.; by writing off 19s. on each of the 2,050,000 £1 ordinary shares; and reducing 48,000 unissued £1 shares to 10s. each. The present issued capital is £3,925,224. In consideration of their foregoing arrears of dividend the holders of the preference shares will be entitled to a non-cumulative preferential dividend of 10 per cent., free of tax, instead of 6 per cent. as at present. To deal with the company's loan obligations, amounting to about £3,450,000, it is proposed to create three new classes of debentures aggregating £4,150,000.

Buell Combustion Co., Ltd.

In the course of his speech at the first annual meeting on October 18th, the chairman (Mr. J. W. Murray) referred to the progress made in perfecting and developing the company's system of pulverised fuel burning. He said that Messrs. Babcock & Wilcox, Ltd., who held a licence for the application of the company's patents to water-tube boilers, had laid down several important installations, including one at the North Metropolitan Co.'s station at Taylors Lane. Among other plants embodying the Buell system were those of the Horden Collieries, Hayle power station, the Imperial Japanese Railways, &c.

Prospectus.

Haslam & Newton, Ltd.—This company is an amalgamation of Newton Bros. (Derby), Ltd., electrical engineers, and the Haslam Foundry and Engineering Co., Ltd. It has an authorised capital of £450,000 divided into 250,000 7½ per cent. cumulative preference shares of £1 each and 1,000,000 ordinary shares of 4s. each. The vendor companies are taking 500,000 ordinary shares as part of the purchase price, and have agreed to sub-underwrite 200,000 preference shares. The net assets are valued at £407,738, and the purchase price is £365,000. This week a public issue was made of 250,000 preference and 250,000 ordinary shares at par.

Norwich Electric Tramways Co.

The net profit for the year ended June 30th last was £21,968, as compared with £22,753 in the preceding year. The addition of £2,309 brought forward makes available £24,297. Of this £10,000 is transferred to reserve, and a dividend of 4½ per cent. is again recommended, leaving £2,417 to be carried forward. The report records further extensions of the motor-'bus services. Meeting, October 30th.

Ransome & Marles Bearing Co., Ltd.

From the profit of £38,556 for the year ended June 20th last the directors propose to pay dividends of 8 per cent. on 400,000 fully-paid shares and 10s. per share on 100,000 new shares; £15,000 is transferred to reserve; and £25,608 is carried forward.

Western Union Telegraph Co.

The earnings report for the nine months ended September 30th shows a gross revenue of $102,845,770, as compared with $100,447,452 in the corresponding period of 1927. The total expenses amounted to $88,893,031 (against $86,468,235), and the net income to $11,306,880 (against $11,290,074).

Herbert Morris, Ltd.

The trading profit for the year ended July 31st last was £95,022, against £75,376. After adding the balance brought forward (£52,386) and other income, and deducting directors' fees and preference and interim ordinary dividends, the balance available was £108,952. The directors recommend a final dividend, making 15 per cent. for the year, against 10 per cent. in 1926-27, when a scrip bonus of 40 per cent. was distributed. It is also proposed to put £20,000 to reserve (against £10,000) and to carry forward £52,952.

Reduction of Capital.

North-Western Anglo-Swedish Electric Welding Co., Ltd., and reduced.—A petition for confirming the reduction of the capital of the company from £30,000 to £15,000 will be heard in London on October 30th.

Allen-Liversidge, Ltd.

The company is issuing 50,000 6½ per cent. preference shares of £1 each at par, upon which existing shareholders will have first option.

Calcutta Electric Supply Corporation, Ltd.

The directors have declared an interim dividend of 5 per cent. actual on the ordinary shares for the half-year ended June 30th, payable November 15th.

United River Plate Telephone Co., Ltd.

An interim dividend of 3 per cent., free of tax, is to be paid on the ordinary shares, as last year.

Erinoid, Ltd.

A final dividend of 4 per cent., again making 7 per cent. for the year, has been declared.

Babcock & Wilcox, Ltd.

The interim ordinary dividend is again 7 per cent., free of tax.

Parsons' Foreign Patents, Ltd.

A dividend of 2s. 6d. per share is being paid on the ordinary shares.

Mersey Power Co.

The offer by this company of 600,000 £1 6 per cent. cumulative preference shares last week was largely over-subscribed on the day of issue.

International Power Securities Corporation.

The common shares are to receive an initial dividend of $1 per share for 1928.

Glenfield & Kennedy, Ltd.

An interim dividend of 4 per cent. actual has been declared on the ordinary shares, as last year.

Hoffman Manufacturing Co., Ltd.

The interim ordinary dividend is again 4 per cent., free of tax.

Urban Electric Supply Co., Ltd.

The interim dividend on the ordinary shares is maintained at the rate of 6 per cent. per annum.

Howard & Bullough, Ltd.

A quarterly dividend at the rate of 10 per cent. per annum has been declared on the ordinary shares.

Anglo-Portuguese Telephone Co., Ltd.

An interim dividend of 3 per cent. has been declared on the ordinary shares, as last year.

Swiss Companies.

The *Société Elektra pour Valeurs d'Electricité*, Zurich, is increasing its capital from £1,000,000 to £1,200,000.

The *Oerlikon Machinery Works Co.* intends to maintain the dividend of 8 per cent. for the past year.

Italian Company.

The *Società Industrie Elettro-Telefoniche* (*S.I.E.T.*), which is stated to be the only large holding company in the telephone field in Italy, recently increased its capital from 200,000,000 lire to 300,000,000 lire, by the creation of 100-lire shares.—*Financial Times.*

Stocks and Shares.

MONDAY EVENING.

THE inundation of the public by the flood of new issues continues to be one of the outstanding financial features of the time, and is beginning to make its effect felt upon other stocks and shares, sales of which become necessary in order to provide the money needed to finance the newer purchases. Consideration of this factor will serve to answer a good many questions as to why particular stocks and shares show a little weakness, or fail to take part in the generally strong tendency observable in most of the markets. The firmness shown by sound investment stocks and shares is the more remarkable in view of the sales just mentioned, and for good-class securities there is still no lack of demand. A gilt-edged borrowing, such as that recently effected by the Birmingham Corporation, can be arranged on a basis of 4¼ per cent. or less, and the amount of first-class security that is available for public consumption might be usefully supplemented by further issues in this department—although, as it has been ironically said, to ensure success with the general public, the gilt-edged stock might have to be offered with deferred shilling shares attached, in order to comply with the fashion of the moment.

Brazilian Traction Boom.

The principal feature in our lists, from the spectacular point of view, is the rise shown by Brazilian Traction shares. The price of these has bounded up 8 points, to 70½, on pressure to buy the shares—from Montreal in particular, but also from Toronto and New York. It will be remembered that the capital was recently reorganised. Rumour now sports with the idea that some further developments are to be expected that will give the shares a higher value than they command to-day. It was but lately that the price stood in the neighbourhood of 55. The preferred shares have put on 30 points within the last week, being up to 225. Attention has been concentrated mainly upon Brazilian Tractions, so far as this particular section is concerned, though a little support for Hydro-Electrics had the effect of putting up the price 3½ to 35. The stable companion of these shares—International Holdings—strengthened to 14¾. Barcelona Tractions, which frequently move in sympathy with Brazilian Tractions, have gained several dollars at 62. Amongst other American dollar shares connected with Hydro-Electric undertakings, no particular changes have occurred, the gains of last week having been well maintained.

Lively Marconi Movements.

Controversy goes on uninterruptedly around the question of the relative values of Marconi £1 shares and 10s. shares. After prices had given way a little, the 10s. shares going back to 73s. 9d. and the £1 shares to 4¼, a violent advance occurred. The former touched 78s.—at seven o'clock last Friday night. London, however, sold shares to New York, and the price at 76s. 3d. is 1/16 up since last week. Baird Televisions fell back sharply on the announcement that the B.B.C. did not intend, at present, to give trials to the system through a B.B.C. station. The Corporation states that it will be ready to review this decision if and when developments justify it. A spirited reply by the Baird Television Company followed the B.B.C. statement. Burndept Wireless shares of 5s. are better at 5s. 9d. Canadian Marconis are up 11s. 3d., to 41s. 3d., the Dominion buyers refusing to be denied. Marconi Marines regained 2s., to 55s., on the hope that the dividend for the current year may exceed 15 per cent.

Home Electricity Shares.

Bournemouth and Poole, with County of London keeping them company, became animated on a pressing demand for the former. It may be recalled that when discussing the bonus issue made not long ago, occasion was taken to suggest that Bournemouth and Poole shares offered to proprietors the paradox of being a cake which the holders could eat, and have it too. The contradiction in terms had reference to the beonus in shares, and, in addition, to the possibility of the company being acquired by one of the corporations whose area the undertaking serves. The price has risen nearly £1 since this statement was ventured. Shares changed hands to-day, Monday, up to 70s. County of London shares have come into demand because of the close connection between the parent and its vigorous offshoot. Another baby of the County of London is the Richmond (Surrey) Company, the shares in which have spurted to 45s. A rise of 3s. 3d. has taken Egham and Staines ordinary to 38s. Urbans took a jump to 37s. 6d. North Metropolitans at 50s. 9d. have shed a few pence.

Cable Stocks.

Following in leisurely manner the Marconi rise, cable shares show improvements in Globe Telegraphs, to 26, and in Westerns, to 25¾. Eastern ordinary stock and "China" shares, while very firm, have undergone no nominal alteration on the week. The apparent fall of 9 in Great Northerns is caused by quotation of the shares ex rights, the latter being equivalent, roughly, to the deduction. A decline of 5s., to 9, in United River Plate Telephones is due to continued anxiety as to what is likely to be contained in the expected report from the company in connection with the rate modifications demanded by the local Government.

Home Rails.

Tube Railway issues have been dull, and Districts are a point lower on the week at 65½, but the income bonds of the Underground Electric Railways, after a drop to 123, rallied

to 125, and, to adopt the Stock Exchange jargon, look like going better. Metropolitan Railway 5 per cent. debenture, 1933-43, advanced to 97¼. The tramways department remains as quiescent as the rubber share market, where interest is focused upon what is likely to happen when restriction comes off, on November 1st.

Debenture Stocks on Offer.

Atlas Light and Power 6 per cent. and 5 per cent. debenture stocks are obtainable at 105 and 95, respectively. The 5 per cent. stock carries an interest-payment due next month. The sixes, recently ex dividend, yield £5 14s. 3d. per cent. on the money, while the senior stock returns 5 gns. per cent. British Thomson-Houston 7 per cent. mortgage debenture stock gives the good yield of 6½ per cent. at 107¾, and 2¼, net, comes off the price, on the Thursday in this week, for interest. But a cumulative sinking-fund is in operation for repaying a certain proportion of the stock annually at 100. A similar condition attaches to the 7 per cent. debenture stock of the General Electric Company, which can be bought at 104¼ to pay £6 13s. 6d. per cent. on the money: the holder runs the risk of having his stock redeemed at 100. A few thousand pounds of County of London Electric 5 per cent. debenture stock is on offer at 103¼, June and December interest. The stock is repayable at 100 after 1964, but the "flat" yield comes to no more than £4 16s. 6d. per cent., and the 5 per cent. War Loan gives as much as this, though it should be mentioned that the latter stock is dated 1929-47. London Power 5 per cent. debenture at 102, recently ex dividend, affords £4 18s. per cent. on the money. Llanelly and District Electric Supply 5 per cent. debenture is obtainable, in a fair amount, at 94.

Misapprehension.

Exception has been taken to the high prices at which shares in the electricity group stand, and the B.E.A.M.A. lucubrations, quoted on p. 694 last week, are used as a text from which to preach warnings of a possible fall in values. Anyone with a few decades of Stock Exchange experience will fight shy of saying what is and what is not financially possible, but the argument that looks for a general fall in electricity supply prices is one which, in this particular case, lumps all the companies together and treats them indiscriminately. Conditions are entirely different in the London group, on the one hand, and, on the other, in the provincial power undertakings. The London companies are expected, reasonably enough, to continue paying their current rates of dividend up to the end of 1931, after which the majority of the companies will move on to a 7 per cent. basis of dividend. The provincial power companies, however, are under no restriction, and, even in the unlikely event—writing with all due deference to the multiple-letter authority—of dividends being reduced temporarily, the companies' position and prospects are so firmly secured as to warrant their holders in retaining the shares as permanent investments. The purchase of such shares is to give to the future a hostage which will probably be ransomed at considerably higher figures in years to come.

Mexicans and Others.

Mexican Light and Power common shares came down 3 dollars to 77¼: Mexico Tramways common shares are 1 better at 45½. The former company's 5 per cent. first mortgage gold bonds can be bought at 77, to give a yield of 6½ per cent. on the money. Mexican Electric Light 5 per cent. first mortgage gold bonds, which are guaranteed as to principal and interest by the Mexican Light and Power, return 7 per cent. on the money at 74, at which they are offered in the market. Better security, and therefore less yield, is to be found in Rio de Janeiro Tramways 5 per cent. 50-year mortgage bonds at 91½ xd. These pay 5½ per cent., and are guaranteed, principal and interest, by the Brazilian Traction Company. The Bermuda Traction 7 per cent. participating debenture that came out a few months back at 100 still stands at a discount of about 5 points on the partly-paid scrip.

Manufacturing and Other Shares.

The Metropole Gramophone Company has offered its proprietors the right to take Everlite 1s. shares, preliminary dealings in which were said to have taken place at 15s. each. The capital of the Everlite Company is £100,000 in two million shares of 1s. each. Ever-Ready shares, on the possibility of competition, eased off to 26s. 6d. General Electric ordinary are 6d. harder at 42s., and the cable equipment shares hold their prices. The main alteration is a 10s. rise, to 25, in Telegraph Constructions. Johnson & Phillips at £2 show a slight decline. A few hundred Metropolitan-Vickers 8 per cent. cumulative preference shares are on offer at 55s. These are £2 shares, and the dividend is paid once a year, in April. Callenders hold their gain at 4¼: the company has repeated its last year's interim dividend of 5 per cent. There is no change in British Insulated ordinary, at 4 3/16, on the order placed with the company for 1,300 miles of aluminium strand. Babcock & Wilcox at 3¾ lost 1/16 of their recent rise, the iron and steel market being a little disposed to waver after the advance of the past few weeks. Lively speculation is afoot in the shares of companies concerned with the combustion of low-grade coal.

Share List of Electrical Companies.

	Nom.	Dividend. 1926.	1927.	Price Oct. 22, 1928.	Rise or fall.	Yield, p.c.
Home Electricity Companies.						
Bournemouth and Poole	£ 1	14†	15	3⅝	+¼	... ...
Brompton Ordinary	1	8⅜	8½	27/-	—	5 8 8
Charing Cross Ordinary	1	8½	8½	27/-	—	5 8 8
do. do. 4½% Pref. ...	1	4½	4½	17/6	—	5 2 10
Chelsea	1	8⅝	8⅝	27/6	—	5 1 10
City of London	1	10	10	33/8	—	4 4 4
do. do. 6% Pref.	1	6	6	23/-	—	5 4 4
Clyde Valley	1	8	8	2	—	4 0 0
County of London	1	7½	7½	42/6	+1/6	3 10 9
do. do. 6% Pref.	1	6	6	23/6	—	5 2 9
Edmundsons' 7% Pref.	1	7	7	25/6	—	5 9 10
Elec. Supply Corporation	1	11	11	67/-	—1/6	3 17 3
Kensington Ordinary	1	8	8	26/6	—	5 5 8
Lancs. Light and Power	1	7½	7½	31/-	—	4 16 9
London Electric	1	8½	8½	27/-	—	5 3 8
Metropolitan	1	8	9	47/-	—	3 16 9
do 4½% Pref.	1	4½	4½	17/6	—	5 2 10
Midland Counties	1	6	6½	30/-	—6d.	4 6 8
Mid. Elec. Power	1	—	15	40/-	—	... ...
Newcastle-on-Tyne Ordinary ...	1	5	6	27/6	—	4 7 5
do. 7% Pref. ...	1	7	7	26/-	—	5 7 8
Notting Hill 6% Pref.	10	6	6	10⅝	—	5 11 7
North Met. Elec. 6% Pref.	1	6	6	23/-	—	5 4 4
St. James' and Pall Mall	5	8	8	27/6	—	5 1 10
Scottish Power	1	8	8	33/-	—	4 17 0
South London	1	8½	8½	27/6	—	5 2 8
Urban Ordinary	1	7	7	1⅛	+⅛	... ...
Westminster Ordinary	1	8½	8½	27/-	—	5 3 8
Whitehall Elec. Invst. 7½% Pref....	1	7½	7½	24/-	—	6 5 0
Yorkshire Elec.	1	8	8	38/-	—	4 5 4
Home Rails.						
Central London Ord. Assented ...	Stock	4	4	78	—	5 9 7
Metropolitan	,,	8	8	65½	—1	4 11 7
do. District	,,	3½	4	79	—	5 1 3
Underground Electric	£1	1½	5	26/-	—	3 17 0
do. do. Income ...	Bonds	6	6	125	—	4 16 0
Telegraphs and Telephones.						
Anglo-Am. Tel. Pref.	Stock	6	6	102½	—	5 17 1
do. Def.	,,	1½	1½	24⅜	—	6 9 0
Automatic Telephone	1	10	10	43/9	—	4 9 0
Eastern Extension	10	10	10	23½	—	*3 18 6
Eastern Tel. Ord.	Stock	10	10	257	—	*3 18 0
Globe Tel. and T. Ord.	10	10	10	26	+½	*3 17 0
do. do. Pref.	10	6	6	11	—	5 7 10
Great Northern Tel.	10	20	20	29xd	—	... ...
Indo-European	25	10	10	47½	—	*5 5 3
Marconi	10/-	5	*10½	31⅞	+⅛	... ...
Marconi-Marine	1	8⅜	12½	55/-	+2/-	5 9 1
Oriental Telephone Ord.	1	12	12	3	—	*4 0 0
United R. Plate Tel.	5	8	8	9	—½	*4 9 0
Western Telegraph	10	10	10	28⅜	+⅜	3 18 0
Home and Foreign Trams, &c.						
Anglo-Arg. Trams First Pref. ...	5	5½	5½	8⅜	—	7 11 9
do. do. 2nd. Pref. ...	5	6	6	8½	—	3 11 6
do. do. 5% Deb. ...	Stock	5	5	70½	—	6 7 5
British Electric Traction Def. Ord.	,,	—	—	540	—	... ...
do. do. Pref. Ord.	,,	8	7½	125	—	6 0 0
Brazil Traction	100	6	7	70⅜	+8	2 9 3
Brit. Colombia Elec. Rly. Pcs. ...	Stock	5	5	90½	—1	5 2 7
London & Sub. Trac. 5% Pref. ...	1	Nil	Nil	10/6	—	... ...
London United Tram Deb. ...	Stock	4	4	60½	—	6 12 3
Mexico Trams, 5% Bonds	—	5	5	73	—	6 8 2
Mexican Light Common	100	Nil	Nil	77½	—3	... ...
do. 7% Pref.	100	Nil	7	81½	—	8 11 10
do. 1st Bonds	—	5	5	76⅜	—	6 10 9
Yorkshire (West Riding)	1	Nil	Nil	5/-	—	... ...
Manufacturing Companies.						
Babcock & Wilcox	1	13	15	3¾	—1/16	*4 5 9
British Aluminium Ord.	1	10	10	2¼	—	*4 9 0
British Elec. Transformer Pref....	1	7	7	18/-	—	7 15 0
British Insulated Ord.	1	15	15	4 3/16	—	3 11 9
Brush Ord.	1	10	10	28/9	—	6 19 2
Callenders	1	15	15	4¼	—	3 10 10
do 6½% Pref.	1	6½	6½	1⅞	—	5 4 0
Crompton Parkinson Pref Ord. ...	1	—	6	19/-	—	6 6 4
do. 8% Pref.	1	—	8	26/3	—	6 2 0
Edison-Swan	£/-	10	10	12/6	—	3 4 0
do. 5% Deb.	Stock	5	5	89½	—	5 11 9
Electric Construction	1	7½	7½	27/6	—	5 9 1
Enfield Cable Ord.	1	20	20	4⅞	—	4 3 4
English Electric	1	Nil	Nil	7/6	—	... ...
do. do. Pref	1	8	Nil	10/-	—	... ...
Gen. Elec. Pref.	1	6½	6½	25/-	—	5 4 0
do. Ord.	1	7½	10	42/-	+6d.	4 16 5
Henley	1	25	25	5½	—	4 5 0
do. 4½% Pref.	5	4½	4½	4½	—	5 6 0
India-Rubber	1	Nil	Nil	13/9	—	... ...
Johnson & Phillips	1	12½	10	2	+⅛	5 0 0
Met.-Vickers Ord.	1	8	6	34/-	—	3 10 7
do. Pref.	2	8	8	2⅛	—	5 19 5
Siemens Ord.	1	7½	7½	1½	—	5 0 0
Telegraph Construction	12	10	10	25	+¼	*4 16 2

*Dividends paid free of Income Tax.

†4% of which was tax free.

Our Foreign Electrical Trade.

Electrical Exports and Imports during September, 1928.

THE increase in the value of electrical exports during September would appear at first to be an improvement. It is so, of course, but this is not entirely true, for the submarine cable item was once more swollen by one of the periodical large shipments. Apart from this, there was a decrease, but it has to be remembered that "thirty days hath September," and five of those were Sundays, which always makes an appreciable difference in the figures. There was a very large decline in exports of electrical machinery—£176,280—reaching the lowest level since June, 1926. Batteries and accumulators fell by £48,327, and large decreases were also recorded by telegraph and telephone apparatus, unenumerated electrical goods, and meters and instruments. The only important increase (£10,252), apart from submarine cables, occurred in the case of insulated wires and cables. As compared with September, 1927, there was a fall of £106,045 in the export total in spite of an increase of £362,646 in the value of exported submarine cables. The machinery section was mainly responsible for this, showing a decline of £181,216. There were several other large falls, the principal of which were telegraph and telephone apparatus (£95,393), insulated wires and cables (£81,792), and batteries and accumulators (£56,572). The result was to bring the total for the first nine months of the year £167,451 below the figure for the corresponding period of 1927.

There is some consolation in the fact that imports also showed a substantial decline, amounting to nearly £100,000, which brought them below the monthly average for last year. In this case, too, electrical machinery was the principal cause, the fall in this section being £97,649. Unenumerated electrical goods, and insulated wires and cables also fell in value, but there was a fairly substantial rise in the case of batteries and accumulators. As compared with September, 1927, the fall was not so great, decreases in electrical machinery, insulated cables and wires, glow lamps, and batteries and accumulators being partly offset by increased imports of telegraph and telephone apparatus and unenumerated electrical goods. The figure for the first nine months, however, remained substantially above that for the corresponding period of last year.

The small re-export section showed increases in both comparisons, the rises being of a general nature.

The following details of the distribution of our electrical machinery exports shows how the decline in that section was accounted for. In the face of the general decrease, it was rather unusual that the least promising market should show a rise substantial enough to put it at the head of the list.

Destination.	Sept., 1927. £	Sept., 1928. £	Inc. or dec. £
European countries ...	64,910	120,185	+55,275
Japan	54,575	2,655	−51,920
South America	65,333	33 011	−32,322
South Africa	74.868	22,342	−52,526
India	100.121	74,967	−25,154
Australia	91,791	59.958	−31.833
New Zealand	33,637	18,116	−15,521
Canada	25.214	13,099	−12,115
Other countries ...	69,791	54,697	−15,100
Totals ...	£580,240	£399,024	−181,216

So far this year our exports of electrical machinery have amounted to £4,977,736, as compared with £5,064,031 in January-September, 1927. The largest share of this has been taken by India (£1,024,474), an advance of about £200,000 being shown. The proportion taken by Australia, which was our principal market last year, has fallen by over £200,000. South Africa, however, shows the largest decline—over £500,000 to £345,969. European countries, which occupied the fourth place in the first nine months of 1927, with a share of £731,230, have risen to second place with a total of £825,178. Broadly speaking, exports of electrical machinery to the Dominions have fallen by £500,000, while exports to other countries have risen by the same amount.

	Exports.			Imports.			Re-Exports.		
	Electrical exports for Sept., 1928.	Inc. or dec. as compared with Aug., 1928.	Inc. or dec. as compared with Sept., 1927.	Electrical imports for Sept., 1928.	Inc. or dec. as compared with Aug., 1928.	Inc. or dec. as compared with Sept., 1927.	E'ectrical re-exports for Sept., 1928.	Inc. or dec. as compared with Aug., 1928.	Inc. or dec. as compared with Sept., 1927.
Electrical goods and apparatus (unenumerated)	£184,971	− £30,900	− £7,009	£122,832	− £21,190	+ £16,280	£6,416	− £2,894	+ £1,980
Insulated wires and cables ...	207,403	+ 10,252	− 81,792	51,267	− 22,160	− 19,773	2,134	+ 1,425	+ 1,532
Glow lamps	42,181	+ 5,726	+ 9,775	34.282	− 5,005	− 12,415	1,079	+ 819	+ 516
Arc lamps and parts ...	502	− 209	− 872	2,624	− 3,305	+ 344	5	− 5	− 58
Batteries and accumulators ...	68.435	− 48.327	− 56.572	78,477	+ 14,493	− 15,952	499	− 194	+ 263
Meters and instruments ...	17.787	− 13,652	− 9 575	19,863	− 1,871	− 4,617	1,225	+ 910	+ 485
Carbons	2,699	+ 2,249	− 1,772	9,636	+ 3,417	+ 4,829	30	− 38	− 71
Switchboards (not telegraph or telephone)	2,876	− 6,919	− 2,703	12	+ 12	+ 12	—	—	—
Electrical Machinery—									
Electrical machinery (unenumerated)	235,451	− 90,631	− 106,799	97,649	− 61,697	− 30,924	11,078	+ 3,016	− 1,893
Railway and tramway motors	28,150	+ 4,605	− 4,566	—	—	—	—	—	—
Other motors and generators ..	135,423	− 90,254	− 69,851	—	—	—	—	—	—
Telegraph and Telephone Cable and Material—									
Telegraph and telephone wires and cable (not submarine)	51,161	+ 251	− 41,562	6,777	+ 68	+ 35	384	+ 384	+ 384
Submarine telegraph and telephone cable	373,058	+ 333,643	+ 362,646	—	—	− 73	—	—	—
Telegraph and telephone instruments and apparatus ...	128,481	− 33,655	− 95,393	55,899	+ 572	+ 16,571	3.045	− 468	− 2,050
Totals	£1,478,578	+ £42,179	− £106,045	£479,318	− £96,666	− £45,683	£25,895	+ £2,975	+ £1,188
		Exports.			Imports.			Re-Exports.	
Increases or decreases for nine months of 928		− £167,451			+ £455,649			+ £19,658	

Conditions in Egypt.

British Share of the Import Trade Increased.

MR. E. HOMAN MULOCK, British Commercial Secretary at Cairo, has reported on the financial and economic situation of Egypt to the Department of Overseas Trade (Stationery Office, 1s. 6d. net).

In his introductory remarks, Mr. Mulock points out that the adverse trade balance of 1926 was succeeded by a favourable margin in 1927. Various factors have combined to increase the potential demand of the country, but a large proportion of the wealth is in a few hands which circumscribes its circulation. The cost of living is excessively high and overhead charges in business are heavy, leading to high prices for many classes of imported goods. There are now so many more wholesalers and retailers competing for a share of the import trade than before that profits have been reduced to the minimum.

Import Trade.

Although the value of imports into Egypt fell from £E.52,400,059 to £E.48,685,128, the share of the United Kingdom rose from £E.11,405,307 to £E.12,482,287, or from 21.8 to 25.6 per cent. Most of the increase was due to the greater coal shipments, but there were notable increases in other classes of goods, among them being electrical and miscellaneous machinery and electric wire and cable. It is pointed out that of five contracts for pumping stations recently placed by the Government only one was, *i.e.*, that at Belquas, secured by a United Kingdom firm. This, however, was the most valuable of the contracts, the tender price being £E.181,325 for the supply and erection of three 2,500-kW turbo-alternator groups and accessories. The success of foreign competition is attributed partly to the fact that consideration was given more to price than to quality, and partly because of the preference of the Government for the older type of Diesel engine.

Imports of British electrical machinery trebled in 1927 and raised the United Kingdom from second to first place with a share of £E.61,756 out of a total from all countries of £E.212,260, which in turn was nearly 40 per cent. higher than the 1926 total. Imports from Italy and the United States remained constant, but Belgian and Swiss supplies were respectively nearly trebled and doubled, while German imports appreciably declined; France, in spite of a slight increase, dropped from first to second place.

Proposed Electrical Developments.

An Italian hydro-electric engineer was engaged in April, 1927, to examine and eventually report to an international commission on the Assuan Dam power scheme which was put forward earlier in the year. In July of that year a German hydraulic engineer was appointed as his assistant. The international commission will also be invited to consider projects for the heightening of the Assuan Dam (for the study of which a British consulting engineer was recently engaged) and the alternative thereto, *viz.*, the construction of a dam at Gebel Aulia in the Sudan.

A project for the electrification of the Helouan railway and the construction of a subway to connect its Cairo end with the main-line terminus were under consideration during 1927 by the Egyptian Government, which engaged a British consulting engineer to study and report on the question.

The Alexandria Municipality, which has for some time been considering the question of purchasing the Alexandria-Ramleh Railway (an electric tramway service) from the existing concessionnaires, has recently engaged a British expert to study the whole question of the urban and suburban tramway and motor-'bus services of Alexandria.

Communications.

In the 1928-29 Budget the telegraphs and telephones have been allotted £E.19,100 and £E.183,900 respectively. The telegraph credit includes £E.5,000 for a wireless station in Cairo to connect with Kosseir, £E.2,800 for a land telegraph line between Assiut and Assuan, and £E.2,000 for a transmitter for the Alexandria wireless station, used for communicating with ships.

Of the share of the telephone administration £E.87,000 is for annual orders, such as instruments for private subscribers and Government departments, and for work on the new underground lines in Cairo and between Alexandria and the provinces, while £E.56,200 is for work already begun. Although the underground trunk line between Cairo and Alexandria, whose construction at an eventual cost of £E.250,000 was approved in the 1927-28 budget, comes under this category, there is no provision for this particular undertaking in 1928-29 because the administration does not expect to have to invite tenders yet for any of the necessary material, for which £E.200,000 of the above sum will be required. A new building to house both administrations at Alexandria is projected; also a new telephone exchange at Heliopolis, and the introduction of automatic telephones at Alexandria and in one of the manual exchanges in Cairo.

The Société Anonyme, formed locally in accordance with the terms of the agreement of May, 1927, between the Egyptian Government and Marconi's Wireless Telegraph Co., Ltd., for commercial exploitation of radio-telegraphy in Egypt, took over the Abu Zabal wireless station from the British Postmaster-General on January 15th, 1928. The record of activities up to the date of the report was most satisfactory; the station was getting all the traffic it could conveniently handle with the existing apparatus.

The Eastern Telegraph Company, in accordance with the terms of its agreement of September, 1926, with the Egyptian Government, laid two new submarine cables (making three in all) between Alexandria and Port Said during 1927 to connect with its new underground lines between Port Said and Suez. As a result, however, of the refusal of the Egyptian Government to sanction the request of the company (which was originally put forward in connection with the terms of the above-mentioned agreement) to lay a cable from Port Said to Haifa, the latter port has been linked up with Cyprus instead, and the consequent effect on the Egyptian Government revenue from external telegraph traffic has had to be provided for in the budget for 1928-29.

Electrical Progress in Spain.

Water Power Schemes and Railway Electrification.

A REPORT upon the situation in Spain has been prepared for the Department of Overseas Trade by Mr. A. Adams, Commercial Secretary at Madrid. (Stationery Office, 1s. 6d. net.) In this it is stated that economic conditions in Spain showed an improvement during 1927, and the progress was helped by the stable political situation. The definite cessation of war expenditure in Morocco laid the foundation for constructive work, while the attempt to enforce the use of home-produced coal also had a considerable effect.

The difficulties of the war period led to the commencement and fostering of a number of native industries, but to-day there is not a single industry in Spain capable of supplying the whole of the home demand. Then, the high costs of production and transport charges render it difficult for these industries to stand up to foreign competition. Hence the demand for the protection of tariffs which has not yet been satisfied. Many Spanish industries feel that they are not yet sufficiently secure from foreign competition, and there seems every likelihood that the protective movement will be carried still further. On the other hand, there are industrialists who see that the high Customs duties have accentuated the cost of living of the working and middle classes, with a consequent increase in wages and salaries which have raised the cost of production to a level higher than that of competitors abroad. This precludes the Spanish industries from competing in foreign markets, which, in turn, prevents them from producing goods on a sufficiently large scale.

British Trade and Trading Methods.

The report contains no details of electrical production or imports. British trade with Spain in general has been to Spain's advantage. During the period 1924 to 1926, according to Spanish statistics, British imports to Spain declined, but in the first nine months of 1927 there was an improvement. In machinery of all kinds, including internal combustion engines, Great Britain, on the whole, has retained her position, though there is formidable competition from other countries in the supply of Diesel engines.

In a study of the success of our foreign competitors in Spain, Mr. Adams says that British manufacturers do not appreciate to the full the benefits of a merchant exporting organisation. The most necessary thing at the present time is the strengthen-

ing of the link between the manufacturer and his customer. This should normally consist of a financing organisation for exports, situated in Great Britain, and a financing and advertising organisation in the foreign country, which would import the goods and distribute them through local dealers. A very important development on these lines has lately been made by the Americans. In the case of motor vehicles a third organisation has been set up to provide facilities for the financing of retail sales. Large scale advertising is necessary to bring the merits of the goods before the customer and to induce the best type of retail agent or distributor to take over the sale of the goods in question. Mr. Adams urges British manufacturers to look towards decreased costs consequent upon a larger volume of production rather than offer terms of commission and profit to foreign importers and wholesalers which are no longer current among their international competitors.

Hydro-Electric Activities.

The writer again mentions the convention between Spain and Portugal respecting the development of the power of the Falls of the Douro. As a result of this agreement it is estimated that Spain will be able to produce 339,000 h.p. and Portugal 285,000 h.p. To carry out the clauses of the convention it is necessary that Spain should execute expensive works in the building of huge reservoirs in order that the international stretch may receive a regular flow, both in winter and summer. The conclusion of the convention has been delayed up to the present because Spain would not relinquish her demand that the Portuguese Government should contribute to the expense of these works. It is for this reason that Spain receives a slightly more valuable share in the delimitation of the international zone. A group of Spanish and Portuguese contractors, who have formed a company under the title Sociedad Hispano-Portuguesa de Transportes Eléctricos, have been awarded the concession for the development of the Falls.

There are no official statistics relating to hydro-electric production in Spain, but from information taken from semi-official and private sources it is estimated that about 1,300,000 h.p. has been developed, while the potential resources amount to about 7,500,000 h.p. The following are the most important hydro-electric undertakings in Spain: Riegos y Fuerza del Ebro, 136,000 h.p.; Energia Eléctrica de Cataluña, 61,000 h.p.; Productora de Fuerzas Motrices, 42,500 h.p.; Hidroélectrica Ibérica, 38,000 h.p.; and Catalana de Gas y Electricidad, 36,000 h.p. Hydro-electric schemes under examination or for which concessions have been granted should, in the not too far distant future add some 3,000,000 h.p. to the available power. The concern, Garcia Fariá y Valdés has a concession for the development of the Tagus, Alagón and Tiltar rivers to produce an estimated 521,000 h.p. Other concessions have been secured by the Riegos y Fuerzas del Ebro (Noguera Pallaresa, Segre and Ebro—258,000 h.p.) and the Catalana de Gas y Electricidad (Esera, Noguera Pallaresa and Noguera Ribagorzana—250,000 h.p.).

Railway Electrification.

In 1925 a railroad fund of 2,600 million pesetas was sanctioned by Royal Decree. Under this scheme State-guaranteed loans to the extent of 800 million pesetas have been raised so far, and the proceeds have been re-lent to the various railway concerns for works including electrification. The Superior Railway Council, which is very active in fostering improvements and new construction, has approved the plan of extensions, improvements and purchases, for the railway companies which have adhered to the Railway Statute, in respect of the years 1926-30. This plan includes the expenditure by nine companies of over 160 million pesetas upon electrical equipment; most of this relates to the Northern Railway (96 millions) and the Madrid-Zaragoza-Alicante Railway (55 millions). The former company has under consideration the conversion to electric traction of 531 km. of route, and the latter contemplates the electrification of about 600 km. The Andaluces Railway Co. also proposes to electrify 600 km. of route. The electrification of the Bilbao-San Sebastian line is well under way, and is expected to be completed by the end of this year.

The Motor-car Exhibition.

The twenty-second international show of the series organised by the Society of Motor Manufacturers and Traders, Ltd.

ACCORDING to the Department of Overseas Trade, over 80 per cent. of the private passenger motor-cars sold at home are of British manufacture, and we join with those who express a hope that in time the industry will be able to challenge the world. In 1923 the number of British vehicles exported was 6,000, whereas in 1927 the figure had grown to 35,000. That serious efforts are being made to expand the industry's markets was made quite evident by this season's Olympia show (October 11th to 20th). The number of low-priced 4- and 6-cylinder cars of from 11 to 15 h.p. specially designed to meet competition were very attractive, whilst the several "baby" cars of from 7 to 9 h.p. were favourably commented upon. A novelty was a pre-selective automatic gear-changing device, and a feature of the cars fitted with super-charged engines was their ability to reach very high speed at full load on an ordinary road.

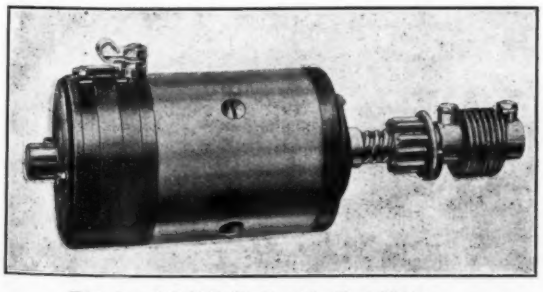


Fig. 1.—"S.C." Engine-starting Motor.

Electrical accessories were as usual displayed in quantity and variety:—

The C. A. Vandervell & Co., Ltd., range of accessories included a class of battery the container of which is made of acid-proof material, which enables the cell cases and outer box to be moulded in one piece. Many of the batteries shown incorporated threaded separators, made of rubber, into which cotton threads are moulded; they are so arranged that while the rubber forms a good insulator, the acid electrolyte can percolate freely through the multitude of threads. Another prominent item was the "S.C." engine-starting motor (fig. 1) with proprietary and standard drives and special pinion engagement controls.

On the Rotax (Motor Accessories), Ltd., stand a feature was made of coil ignition and dynamos incorporating distributors (fig. 2). Switchboards of various types (fig. 3) included elaborations with the faceplate enlarged to permit of such other instruments as clocks, speedometers, &c., being countersunk in such a manner that they can be flood-lighted at night without the source of illumination being visible.

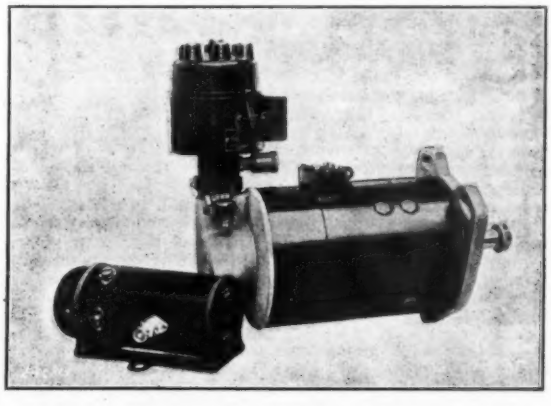


Fig. 2.—Dynamo with Ignition Distributor and Coil.

The Hart Accumulator Co., Ltd., display was representative of its various types of car batteries. The "Uni-blok" container is moulded in one piece of "Herculex" material. Hand lamps fitted with 4-volt accumulators and suitable for garage use and portable work generally were also on view.

Batteries, Ltd., exhibited for the first time an all-steel alkaline battery for private car starters, the development of which has followed the standardisation of "Nife" batteries by a number of large omnibus concerns. Of very low internal resistance, the steel container is not liable to crack or leak,

and the steel plates resist vibration and the tendency to buckle, the active material being totally enclosed in a perforated steel envelope.

Klaxon, Ltd., electric horns included a high-frequency model, which supplements the original type with the "sawtooth" note. Its distinctive warning tone resembles that of a saxophone, the instrument being guaranteed for 12 months, is weatherproof, and can be had for 6- and 12-volt circuits. Another special type is the two-note model, with which either a penetrating or persuasive warning can be sounded. The company's electrically-operated wind screen wipers are silent in operation, neither the whirr of the motor or the "click" of the blade when it reverses can be heard. Two patterns were shown—with one blade and with two interconnected arms. The double-arm model affords a much wider range of view, for each arm cleans an arc 21 in. wide. When out of use the arm, or arms, can be folded up out

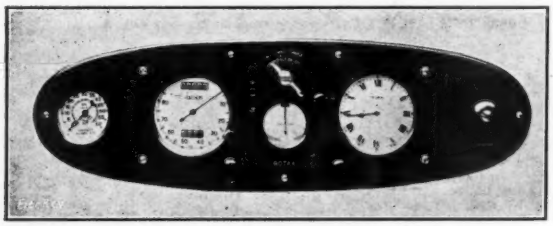


Fig. 3.—Switchboard with Internally-lighted Dials.

of sight, and brought into use instantly by a single switch. Neither pattern interferes with the lighting and starting equipment of the car, and either is easily installed, the electric motor requiring neither adjustment nor lubrication.

The British-Thomson-Houston Co., Ltd., showed not only magnetos of the rotating-armature and polar inductor types, but also coil ignition equipment, starting and lighting sets, and "Mazda" automobile lamps. Impulse starters can be supplied as an integral part of all but the smaller magnetos and assist even very large engines to start with ease, while the automatic ignition timing device simplifies driving and minimises gear changing, as the engine timing is varied automatically according to the speed without in any way affecting the quality of the spark. The automatic timing device provides a 30 deg. range on the magneto spindle, whilst the contact breaker base may be fixed, or arranged to provide 15 deg. or twenty-two deg. on the manual control, according to requirements, thus making a possible total movement of 52 deg. in the magneto. With combined magneto-coil ignition sets a change-over switch, controlled from the dashboard, enables the driver to change quickly from one system to the other. Coil equipments are suitable for 6- or 12-volt circuits, on either the insulated (2-pole) or earthed (single-pole) system; manual control or automatic advance control may be provided to suit individual requirements. Both the primary and secondary windings of the coil are subjected to a vacuum and impregnating process during manufacture so as to prevent the intrusion of moisture, while a large leakage distance at the edges of the insulation ensures a high factor of safety. The windings and condenser are arranged in a tubular container which is filled with bituminous compound having a high melting point, a metal cap being fitted to this container, and serving as a mounting for the ballast resistance which is provided to prevent damage to the windings should the ignition switch be inadvertently left "on" when the engine is stationary.

The Rothermel Corporation, Ltd., amongst other accessories, featured a tool of manifold general utility. There is seemingly no end to the number of jobs that "Lindy" can tackle: sanding, polishing, drilling, grinding with the aid of rotary files and emery pencils, screwdriving and nutsetting are but a few of the operations which it will perform quickly with precision, whilst in the garage it should be equally useful for decarbonising and magneto bench tests. In fact, the machine is the equivalent of a battery of individual electric tools, each designed for one particular job only.

London's Electricity Supply.

The Joint Authority's First Return.

EIGHTEEN months have elapsed since the London County Council issued its last return (for 1924-25) of electricity supply in London and Home Counties Electricity District. The series has now been taken up by the Joint Electricity Authority of the District, which has published a return relating to the years 1925, 1926, and 1927.*

The form of the earlier returns is retained. The first set of tables enumerates the various municipal and company undertakers showing their areas and detailing the Orders which they hold. It includes 16 Metropolitan borough councils, 30 municipal corporations and urban district councils, 15 London companies, and 32 extra-London companies—a total of 93 undertakings, to which the Authority itself is added, making 94.

At March 31st, 1927, the Metropolitan borough councils possessed generating plant of a total capacity of 295,827 kW; the extra-London local authorities had 174,767 kW; the London companies had (at December 31st, 1926), 553,975 kW; and the extra-London companies 79,078 kW; giving a total of 1,103,647 kW, of which only about 76,000 kW was d.c. plant. Owing to the interchange of power, &c., it is not easy to ascertain the actual total sales during the period. The generating statistics, however, show a total output of 1,557,568,766 kWh, of which the municipalities produced 661,348,231 kWh and the companies 896,220,535 kWh. The consumption of fuel per kWh varied between wide limits, *i.e.*, from 2.00 lb. to 6.14 lb. The former figure was shown by the Hackney and West Ham municipal undertakings. The 1925 figure of the Central Electric Supply Company was 1.82 lb.; the 1926 figure is not given.

The financial statistics show that the municipal authorities had expended £24,418,585 upon capital account at March 31st, 1927. Of this £1,459,248 was contributed from revenue, the balance being raised by loans. The proportion of loans repaid or provided for by sinking fund was 40.56 per cent. The expenditure is analysed as follows: Generation, £9,810,856; main transmission lines, £581,830; distribution, £12,049,631; hired apparatus, £194,122; miscellaneous, £1,782,147. The municipalities' total working costs are given as £3,099,899, and the following is an analysis of these costs: fuel, £1,356,702 (against £831,528 in 1925-26); other generating costs, £513,955; energy purchased, £449,541; distribution, £358,381; management, £421,320. The average working costs per kWh sold amounted to 1.16d. (against 0.98d. in 1925-26). Other charges against revenue brought the total expenditure to £3,788,040, against £2,961,249 in 1925-26. The total revenue from the sale of energy was £5,093,104, or 1.91d. per kWh, as compared with £4,591,313 and 1.88d. per kWh in the preceding year. Miscellaneous revenue raised the total to £5,469,554 (against £4,933,510). The gross surplus is shown as £1,743,669, as compared with £2,045,495. The details of appropriation were as follows: loan interest, &c., £635,108; sinking funds and loan repayment, £828,461; applied to capital outlay, £263,335; transferred to reserves, £96,023; contributed to rates, £129,818; decreasing the balance on net revenue account by £209,076.

The amalgamated accounts of the company undertakings show a total capital expenditure at December 31st, 1926, of £37,303,624, against a total capital raised of £34,405,800. The latter figure was made up of loans, £11,136,322; preference capital, £8,934,500; and ordinary capital, £14,334,978. Depreciation, reserve and renewal funds amounted to £4,590,480, and the total balance on revenue account to £368,428. The total working costs of the companies amounted to £5,857,427, or 1.02d. per kWh sold (against 1.03d. in 1925). These costs were made up as follows: Fuel, £1,446,526; other generating costs, £608,293; energy purchased, £2,651,994; distribution, £498,990; and management, £651,624. Other expenses raised the total to £6,874,996, against £4,137,845 in 1925. The total revenue from the sale of energy was £9,942,485 which, neglecting intersales, represented 1.74d. per kWh; the previous year's figures were £7,605,613 and 2.30d. respectively. The total revenue is shown as £10,405,891, against £8,000,279. The gross surplus is given as £4,128,033 (which excludes the Chiswick undertaking, whose figure was not available), as compared with £4,252,582 (excluding Chiswick) in 1925. Of this interest absorbed £791,017; preference dividends, £520,484; ordinary dividends, £1,249,649; and depreciation and reserves, £1,244,791. The balance on net revenue account was increased by £262,931.

Following these accounts particulars are given of bulk supplies given and received during the period reviewed. The next section shows the total amount of energy sold by each undertaking in the District in 1913-14 and in each year from 1922-23 to 1926-27. The increases in 1926-27 over 1925-26 are shown as percentages, and from the table it is seen that while the sales of the London companies rose by 34.5 per cent. and those of the extra-London copies by 16 per cent., the sales of the Metropolitan boroughs increased by only 6 per cent. and those of other municipal authorities by 9 per cent. The overall increase was 16 per cent. The large rise in the case of the London companies is seen to be due to the operations of the London Power Co., the County of London Co., and the London Electric Supply Corporation.

An appendix to the return gives very full details of the charges of each undertaking, and, as usual, a bewildering variety of methods and rates is presented. The section cannot easily be used for purposes of comparison; the nearest means of comparing the charges of the various undertakings is the statement of receipts per kWh which appears in the accounts sections.

* Published by the Authority at 5s.

The Fuel Conference.—IV.

Proceedings at the Sectional Meeting of the World Power Conference held in London.

The Combustion of Victorian Brown Coal.

(Abstract of Paper prepared by the State Electricity Commission of Victoria.)

The exploitation of the Morwell area was started in 1889 by a company, but after a brief period of activity, operations were suspended until 1916, when the old workings were reopened by the Mines Department of Victoria; work was carried on for about five years, when they were taken over by the Electricity Commission, under whose supervision they have been actively worked up to the present time. It is, however, intended to reduce operations on the Morwell Cut in the near future, almost to the point of closing down; the reason is that the Morwell Cut is limited in extent, and the winning of the coal becomes more costly as it becomes reduced. On the other hand, the coal available from the New Yallourn Opencut, about half a mile distant, is comparatively limitless, and there operations have now developed beyond the expensive opening-up stage, so that this coal is now on an equal economic basis with coal from the Morwell Cut, and likely to give more economic results in the future.

The Morwell coal has a moisture content of less than 50 per cent., while that of the Yallourn coal is usually 64 per cent.; moreover, the Morwell coal is of a hard nature, while the Yallourn coal is extremely friable and earthy-looking.

In designing boiler plants intended to utilise brown coal in the raw state, many difficulties are experienced, due principally to the moisture present and the relatively low heat value of the combustible. The effect is that the grate area must be made correspondingly larger.

A series of tests was commenced in 1917 at the Melbourne City Council's power station, with the result that a special furnace and grate arrangement was evolved for use on a Babcock & Wilcox boiler with a heating surface of 4,780 sq. ft. The unit was equipped with a Babcock chain grate of 96 sq. ft. area arranged for use with air pressure under the grate and a return arch setting which compels the major portion of the hot gases to pass back over the wet coal coming on to the grate, as experiments proved that an arch arranged to cover the front sections of the grate only would not ignite a fuel containing 45 to 50 per cent. moisture. The results of the trials were considered conclusive enough to be used as a guide in designing the grate and furnace equipment for the Yallourn power station. The type of grate adopted for the power station was the Underfeed Stoker Co.'s Class "A" balanced draught stoker, arranged with a return-arch combustion chamber, but with an increased length of flame travel from the grate to the boiler heating surface. The plant consists of twelve boilers, each of 14,425 sq. ft. heating surface, equipped with integral superheaters of 2,727 sq. ft. heating surface, and fired by three grates each 122 sq. ft. in area. Each boiler unit is rated to evaporate 70,000 lb. of water per hour from feed at 160 deg. F., into steam at a pressure of 260 lb. gauge and a temperature of 650 deg. F.

Three acceptance tests made on one of the boiler units when burning the Morwell brown coal show that with a creditable efficiency the grates are capable of burning over 60 lb. of raw coal per sq. ft. per hour. Under normal operation it is usual to operate at higher ratings, and it has been found possible to burn up to 83.5 lb. of coal, corresponding to a liberation of 417,500 B.th.u. per sq. ft. of grate per hour.

The combustion of the Yallourn brown coal with its moisture content of 64 per cent., however, presented infinitely greater difficulties than the Morwell coal. The first scheme adopted was to use the hot flue gases at the boiler exit for drying the fuel. A design of dryer for the use of screened coal, based on the original experimental dryer, was evolved for the boilers of the main power station. Tests on these dryer units indicated that with Yallourn brown coal, screened to a maximum size of 1¼ in., and when only a very small percentage of coal below ¼ in. in size was being used, an average furnace temperature of 2,200 deg. F. was obtained with 13.2 per cent. of CO_2 in the flue gases. The coal had 65.4 per cent. moisture entering the dryer, and 55.2 per cent. leaving the dryer. This was very satisfactory, operating on the 64 per cent. moisture content Yallourn coal of the same texture but with the plant as originally installed for 50 per cent. moisture coal.

For a time screened coal of this texture was employed at the power station, but soon the difficulties accompanying the screening of coal having the Yallourn characteristics became so serious as to render a change of method necessary.

About the time these conclusions had been reached, the exigencies of the demand for further output from the power station called for steps to be taken to attain quicker results. The results tended to show the inadequacy of the small space available, and it was decided to dismantle the dryers one by one as other substitutes became available.

The next modification aimed at drying the coal after it had entered the combustion chamber, thereby gaining the advantage of the furnace temperature; in other words, introducing the raw coal direct on to an increased grate area. Auxiliary step grates were applied to supplement the chain grate, and had an appreciable effect, 74,040 lb. of steam per hour being obtained from the boiler units when burning Yallourn brown coal with the pieces of coal over 2½ in. in size screened out. This evaporation is equivalent to 77.6 lb. of coal consumed and a heat liberation of 239,600 B.th.u. per sq. ft. of total grate area per hour. It became necessary to try alternative methods for extensions to the power station in a second boiler house, and one of the original boiler units of the main power station was fitted with inclined mechanically-moving step grates to operate with air pre-heated to a moderate degree.

The most important point to notice about burning brown coal on inclined step grates, whether mechanically moving or fixed, is that the fundamental principle governing the burning of brown coal is fulfilled to a certain extent automatically, *viz.*, the coal in the pre-heating and drying zone is in a thick bed, while in the combustion zone it is thin. This accomplishes two important things:—(*a*) Supplies the major portion of the air to the thin portion of the fuel bed; that is, to the active portion of the fire. (*b*) Provides a large quantity of semi-dry coal sufficient to meet the normal fluctuations in the steam demand from a boiler unit without adjustments of fuel bed thickness and without demanding, in the case of a mechanical type of grate, such close attention to stoker speed regulation as is demanded by the horizontal chain grate.

An important factor in the success of a grate burning brown coal is that the bars of the grate should be designed to encourage "under-burning" to take place to the fullest extent possible. "Under-burning" is the name given to the burning of the coal which accumulates between the bars and which does not pass along at the same speed as the coal itself. This coal, being stagnant, dries readily and ignites, thus creating a marked drying effect on the fuel bed. The basic design of the mechanical step grates installed under one of the boiler units makes it possible to control the coal in three different places on the grate surface, with the result that the combustion process is capable of more accurate and efficient control.

Following on the success of the inclined fixed grates when applied to the chain grates, it was decided that any step grate, in order to make the most of the space available, should be equipped with some form of drying shaft situated inside the combustion chamber. The shaft adopted consists of a staggered arrangement of firebrick walls set in the combustion chamber at such angles that the coal, during its passage down the dryer, is compelled to take a zig-zag path. Preliminary trials of this drying shaft and mechanical step grates recently installed on a boiler in the existing boiler house have shown that it is possible under operating conditions to burn 95.2 lb. of Yallourn brown coal, corresponding to a liberation of 294,500 B.th.u., per hour per sq. ft. of grate.

In view of the success attained with this trial unit, it is proposed to adopt the same general design for the first section of boiler plant to be installed in the second boiler house at Yallourn. The boiler house is being designed to accommodate 12 boiler units, each with a normal evaporation of 75,000 lb. of steam per hour from feed water at a temperature of 280 deg. F. into steam at a pressure of 270 lb. per sq. in. (gauge) and a temperature of 700 deg. F. at the superheater stop valve. The units are to be designed to burn Yallourn brown coal containing 64 per cent. moisture, and will be equipped with mechanical step grates and drying shafts.

Experience has demonstrated that air pre-heating is extremely beneficial in its application to brown coal burning at Yallourn; it increases the flexibility of the boiler, enabling steam to be raised more quickly than with cold air, it increases the grate capacity 15 per cent. to 20 per cent., and it decreases the loss due to the unburnt particles of coal carried off in suspension by the furnace gases.

The Storage and Handling of Solid Fuels.

By R. K. Stockwell.

(Abstract.)

It is generally accepted that the main cause of the spontaneous combustion of coal is the direct action of the atmospheric oxygen on the coal itself. The principal part played by pyrites is to break up the coal into fines by slow oxidisation of the pyrites. This disintegration is aided by the alternate wetting and drying of coal in storage. The fine coal oxidises more quickly and at the same time prevents free circulation of air carrying off the heat as fast as it is generated by oxidisation. Complete safety for stored coal lies either in sufficient ventilation, or else in hermetically sealing the coal from all access of oxygen. To secure free circulation of air, all fines

must be removed and only lump coal stored; this is not economical. Elimination of air altogether means underwater storage, which is not always possible or desirable. Rolling and closely packing the pile is nearly as effective as underwater storage. Making a homogeneous pile, by preventing segregation of sizes, retards oxidisation.

The time of greatest danger from spontaneous combustion is from six weeks to three months after storing. The heating generally begins about 7 ft. from the surface, at a point deep enough to prevent the escape of heat as generated and still near enough to the surface to maintain the supply of oxygen. In a homogeneous or packed pile this point is much nearer the surface and moves about, due to changes in surface temperature, thus preventing firing. When storing an unfamiliar bituminous coal the temperature at various points in the pile should be watched carefully, by means of pipes sunk into the pile, and at 130 deg. F. warning should be taken. At 150 or 160 deg. the coal should be used, or moved and spread out to cool. At 180 deg. smoking will begin and firing is about to start. With an unfamiliar coal or one known to heat easily, the storage system should be one with which a hot spot in the pile can be dug out and spread easily, away from anything likely to be endangered if it should break into flames. Such hot spots should be handled carefully, and a good supply of water should be at hand to quench flames that might start. Water is of little use after firing has started, except to quench surface flames; wetting a burning coal pile often forms a wall of coke around the burning part, preventing the water from reaching the heart of the fire and allowing the fire to break out again later. A deluge of water that reaches a warm spot will prevent further heating.

The storage ground should be dry, level, and free from drainage from any source. Care should be taken that pieces of wood, oily waste, or other combustible material, are not mixed with the coal in storage. Avoid storing coal near external sources of heat, even though the heat transmitted be moderate, and do not store against buildings. Avoid admission of air to the interior of the pile through drains beneath the pile and around foreign objects, such as poles, posts, gantry legs, girders, beams, irregular brickwork, or through porous bottoms, such as coarse cinders. Do not place different kinds of coal in the same pile, nor place fine coal adjacent to lump coal, as fires tend to start on the borders between the two. Pile the coal homogeneously so that all sizes are well mixed together. Avoid coning, rolling down a side of a pile, or other causes of segregation and stratification, since an open stratum of lumps permits air to reach and oxidise the fine coal, and the stratum of fine coal does not permit the heated air to pass off rapidly enough to keep the temperature below the point of combustion. The height of the pile depends on the nature of the coal and the method of storing. Piles 5 ft. deep have taken fire and many piles 50 ft. deep have not. If stored without care the piles should not be over 12 or 15 ft. deep. If stored according to the above rules, coal is fairly safe 20 to 25 ft. deep, but if also rolled and packed into storage, the coal is practically as safe as in underwater storage and the pile may be of any height.

When coal is stored under shelter, or inside buildings, surface ventilation should be secured to facilitate the escape of gas by the circulation of the atmosphere. When a fire is discovered in a storage pile, the only satisfactory method of extinguishing it is to dig it out, remove the coal to another section of the yard, and spread it out to cool. It is always advisable to make the storage in such a way that any part of the pile may be moved promptly if necessary.

The heating value of coal seems to be decreased little by storage, possibly from an average of 1 per cent. up to a maximum of 3 per cent., during the first year in open storage. No deterioration whatever is experienced with coal stored under water, and little in a packed pile, while there is apparently an actual gain in heating value in coal stored under salt water. Stored coal loses a little of its coking qualities and of its value for making gas, and in firing it needs to be spread in thinner layers over the firebox.

In forming coal piles, the coal should never be discharged from the grab at a height and allowed to drop, roll, and segregate. What is called "spread piling" should be adopted, the grab being opened close to the surface of the pile each time, its load being deposited as a whole in one spot, and different spots chosen each time to keep the surface as level as possible while building the pile.

If the pile be rolled by a heavy roller or a heavy tractor after each layer or two of coal has been added, the pile may be safely built to any size and height. A heavy caterpillar tractor, drawing an ordinary road scraper or drag, may be used to spread the coal from where it has been placed by the grab, and make a tightly-packed homogeneous pile.

Section E: Oil Industry—Economic and General Considerations.

Sir Robert Waley Cohen presided on September 25th, when Mr. J. Kewley summarised the two papers which had been submitted for consideration, *viz.*, one by Mr. E. H. Davenport on behalf of the Institute of Petroleum Technologists on "The Economics of the Oil Industry and the Influence of By-Products," and one by Mr. K. Hashimoto, of the Power Association of Japan, on "The Oil Industry in Japan." In the first of the papers it was pointed out that the major problem of the industry since the war had been that of producing sufficient fuel for the ever-growing automobile movement. The increased demand had been so successfully met that the price of motor spirit showed the least increase since 1913 of any of the commodities in everyday use. As the demand for the other products of crude oil had not increased, had it not been for the larger yield of petrol therefrom, the price of motor spirit would have soared. In other words, the increased efficiency of the refining processes had cheapened the price. The second paper gave a *résumé* of the position of the oil industry in Japan, where the production has more than doubled in six years.

The discussion was opened by Dr. G. Egloff, an American authority on oil cracking, who stated that even if the number of motor vehicles in the world continued to increase at its present rate, there were sufficient known oil supplies to last for the next 100 years, the recent discoveries of oil in West Texas, even to experts, being staggering. Now 70 million barrels of gas oil were being used annually in the United States.

The chairman, Sir Robert W. Cohen, referred to the improving quality of motor spirit, and welcomed the increasing attention which was being given to Diesel engines.

Section N: Internal-Combustion Engines.

The meeting of Section E was immediately followed by that of Section N, relating to internal combustion engines, over which Sir Robert W. Cohen also presided, and for the consideration of which nine papers were submitted. These fell into three main categories of volatile and heavy fuels for automobile engines, and engine design and operation, the contributions embodying British, Belgian, Swiss, German, Russian, and Swedish experiments and experience. Mr. O. Thornycroft read a lengthy summary of the papers, in the course of which he pointed out that if, as appeared likely for some time to come, the cost of heavy fuels of the gas-oil type remained well below that of the present type of motor fuel, the heavy oil engine would offer a distinct advantage with regard to fuel costs. He also made special reference to the paper by Mr. P. Yanouschevsky describing the experiments with Diesel-engine-driven locomotives on Russian main line railways. From this it appeared that following initial trials with a locomotive built up from existing units, with a Vickers 1,000-h.p. ten-cylinder wartime submarine engine, two generators and an electrical drive, two special locomotives, each of about 1,100-1,200 b.h.p., were built, one with electric drive, and the other with gear transmission through the medium of magnetic clutches. While the trials so far had shown a slight advantage in favour of the geared machine, the operating costs of both the Diesel locomotives, on a combined total running of about 53,000 miles, had worked out to approximately 76 per cent. of those of a steam locomotive of equal capacity.

An interesting discussion followed, in which Messrs. H. R. Ricardo, J. Lubbock, W. A. Tookey, W. A. Whatmough, and M. Gercke (Germany), Prof. Burstall, Major E. G. Beaumont, and Dr. Egloff took part. The discussion dealt largely with engine design and the respective merits of light and heavy oil engines for road use. Mr. Lubbock, in congratulating the Russian railway engineers on their work in connection with Diesel-engined locomotives, drew attention to the fact that considerable work was being done in the same direction in other countries, such locomotives being now also in use in Canada, the United States, Sweden, Germany, Switzerland, Tunis, Holland, and the Argentine, while in this country, the London, Midland and Scottish Railway Co. was experimenting with a Beardmore 500-h.p. Diesel petrol-electric locomotive. In some countries, even better results were being obtained than was apparently the case in Russia. In one instance a 197-h.p. engine was being run at a cost of £377 for Diesel engine fuel as against a coal bill of £1,820 for an equivalent steam locomotive, while in Sweden, tests had shown that even with liquid fuel costing seven times as much per ton as coal, an economy in running costs could be effected.

Section F: Composition, Classification, Preparation, Storage, and Handling of Liquid Fuels.

On September 25th twelve papers, emanating from eight different countries, were down for consideration. Sir Thomas Holland, F.R.S., who presided, drew attention to the fact that, in contradistinction to agriculture, which was practically universal, the mineral resources of the world were irregularly allotted, a state of things which rendered one country largely dependent on another. Consequently he regarded economic considerations such as these as the real basis of a world peace. The report on the papers was prepared by Dr. A. E. Dunstan. From the power station engineer's point of view chief interest lay in the paper in which Mr. J. Lubbock gave some valuable information on the grades of fuel oil commonly used, with their physical and chemical characteristics, this being followed by a description of means of heating, filtering, transmitting and pumping fuel oil, together with details of a typical user's installation.

The papers gave rise to a lengthy and interesting discussion, opened by Dr. Egloff, who, in order to provide for the eventualities indicated by the chairman, considered that any country that had no oil resources of its own should always keep a stock in hand of 100 million barrels of fuel oil and

established oil-cracking plants. A good deal of the discussion centred round the anti-knock and detonating characteristics of fuel oils, while references were made to the possibilities of the production of synthetic rubber from certain oil fractions.

Section H: Products of the Carbonisation Industry.

On September 27th Mr. J. Terrace (president of the Institution of Gas Engineers) presided. The 18 papers presented on the subject were summarised in the general report, prepared by Mr. T. C. Finlayson.

Mr. E. V. EVANS (joint manager, South Metropolitan Gas Co., and vice-chairman of the Section), who opened the discussion, briefly reviewed the various papers presented. With regard to the paper by Dr. J. G. King (Chief Chemist to the Fuel Research Board) on coal blending and the production of solid smokeless domestic fuel, he said Dr. King had forecast indirectly that the blending of coal was essential if it were required to produce a coke whose characteristics might be controlled.

In the course of the discussion Mr. JOHN ROBERTS stressed the importance of Dr. King's conclusion that of the 10 million tons of coke produced annually for sale, a large proportion could, by the methods suggested in his paper, be made suitable for domestic consumption. It had been shown that if domestic fuel was to be the chief product, it was not really necessary to work at low temperature. If large yields of oils were required, however, it was another matter. The high-temperature system of manufacturing semi-coke was only a partial solution of the domestic fuel problem, and he could conceive of several low-temperature processes being successful. There was plenty of room for them.

Mr. ROY ILLINGWORTH referred to a pre-heating process, as an alternative to blending. In this process the coal was heated to a temperature, generally below 400 deg., for a short time in order to eliminate the less stable compounds, and the resultant product could be carbonised in ordinary ovens to produce a coke of high reactivity. The preheating might save about 30 per cent. in the time of carbonisation, as the product charged into the oven would be drier than ordinary coal.

Section K: Utilisation of Fuels, including Electricity, for Industrial Furnace Work.

Quite a wide range of subjects was embraced in the work of Section K on September 28th in no fewer than 16 papers. The meeting was presided over by Mr. GEORGE A. ORROK (an American delegate), while Mr. ROGER T. SMITH acted in the dual capacity of vice-chairman and general reporter. Many of the papers referred entirely to other than electrical and electrical application matters, and need not therefore be referred to here. It may be mentioned, however, that in a joint paper on "Industrial Heating," by Sir Robert Hadfield, Bt., and Mr. R. J. Sargant, a point which attracted considerable attention was that the Sheffield steel firm with which Sir Robert is associated is now producing a steel that is able to stand a temperature of over 1,000 deg. C. without oxidisation and yet maintain sufficient strength, thus providing a valuable steel for use in furnaces and in recuperators for saving furnace heat.

The use of electricity for industrial heating was specifically dealt with in six papers, two of which emanated from Japan and one each from Austria, Canada, the United States, and Great Britain.

Dr. T. KAWASAKIYA, in his paper on "The Use of Electricity for Industrial Heating," described the results of tests carried out by the Power Association of Japan, the experiments having shown that the efficiency of an electric furnace could best be determined by first ascertaining the thermodynamic efficiency and then determining the relative contribution efficiency, the product of these two quantities giving the thermal efficiency of a furnace.

Dr. A. VELISEK, in his paper on "The Use of Electricity for the Production of Heat in Industrial and Manufacturing Installations," stated that there had been a steady growth in Austria of the use of hydro-electric power for heating water, steam raising, mould drying, rivet heating, welding, smelting and reverberatory furnaces, while other uses of electricity were being explored. A table in the paper gave details of the additional loads on Austrian power stations due to the use of electricity for heating, which showed that the effect of a night load for heating purposes had greatly improved the twenty-four-hour load curve. The experience in Austria was, the author stated, that steam raising by electricity was economical so long as a kWh did not cost more than from ⅓ to ½ of the cost of a kilogramme of coal.

In a paper on the same subject in its application to the United Kingdom, by Mr. S. E. MONKHOUSE, of the British Electrical Development Association, it was stated that an analysis of some two and a half billion B.th.u. used in engineering works, brass foundries, shipyards, paint works, soap works, potteries and bakeries showed that the percentage of the total heat units that was produced electrically varied from ¼ to 1 per cent. in potteries to 6½ per cent. in engineering works. The author stated that the use of electricity for industrial heating purposes was extending in Great Britain, particularly in connection with heat treatment and tempering processes, for although the cost of the actual heating might be greater than that of fuel, very satisfactory results were obtained.

Still on the same subject was a paper by Mr. A. T. STUART (Canada), in which he developed the view that, since the fundamental constituents of fuel were hydrogen, oxygen and carbon, and that combustion of a hydrocarbon fuel was hampered by the 80 per cent. of nitrogen in the air, pure oxygen for the enrichment of air would be made in the future by the electrolysis of water. The author showed the advantage to electricity supply undertakings in filling up the seasonal valleys of the electricity load curve by such an electrolytic curve, and provided the oxygen and hydrogen, or, in other words, the electricity, were cheap enough, he predicted the use of fluid fuels. Oxygen and hydrogen had many industrial uses, if cheap, and he estimated that they could be supplied at ½d. per 1,000 cu. ft. by the use of peak hydro-electric power.

The position of electricity and industrial heating in the United States was explained in a joint paper by the American Institute of Electrical Engineers and four other American technical societies. The authors estimated that in the United States some 2,000,000 kW of electricity was being used for industrial heating, representing a little more than 10 per cent. of the electric motor load. A survey made two years ago showed, however, that there was an industrial heating load in America, including electric cooking and baking, which could utilise 47,000,000 kW. Among the purposes for which electric heating at high temperatures was being used successfully were ferrous and non-ferrous metal smelting—with the advantage that the furnace gases could be made oxidising, reducing, or neutral at will—and for vitreous enamelling and japanning, baking and drying in ovens mostly at temperatures not exceeding 1,000 deg. F.

Finally, in a paper on "The Application of Electricity to the Firing of Enamels on Porcelain," Mr. K. MATSUNAGA showed that in Japan the cost of energy for the electrically-heated kiln taken during the night at 0.4d. per kWh was only half that of the fuel for wood-fired kilns. Apart from the lower heating cost, electrically-heated kilns had the technical advantages of the time saved in heating up and cooling down, the complete absence of moisture from the kilns, and cleanliness, all of which factors helped towards the production of an improved finished article.

A lengthy discussion followed the reading of the summary of the papers, but, like the latter, it dealt very largely with questions applying to solid or liquid fuel heating.

Mr. T. SETTLE furnished some interesting information regarding the use of electricity in bakeries, not only abroad, but also in this country. There were, he said, many advantages in using electrically-heated baking ovens, among which he mentioned bigger output for equal space occupied, cleanliness, better health of the bakehouse workers, and greater controllability of both the top and bottom heat. Baking operations were mainly conducted during the night and mornings, and in view of this some electricity undertakings were supplying power to bakeries at special rates, an example which he considered could be advantageously followed by other power suppliers. Experience had shown that if power could be supplied at ½d. per unit it would compete seriously with other forms of baking oven heating.

Mr. GIFFORD gave some useful information regarding the use of electrically-heated furnaces for iron and brass melting, and stated that over 250 million kWh were now annually being used throughout the world in brass melting.

Mr. SPIERS considered that progress in the use of electricity for industrial heating purposes had been delayed owing to the lack of suitable resistors. This difficulty was, however, being overcome, and he cited a Swedish pottery works which was able to obtain more heating power from one ton of coal used as boiler fuel in generating electricity by steam than when the same quantity of fuel was used for the direct firing of the kilns. In his opinion half of the total number of pottery kilns in this country could be economically heated by electricity.

Mr. LOBLEY also spoke of the advantages of electrically-heated metal melting furnaces, and considered that even if the cost of working was higher than with other forms of heating, it was in the end economical to use them owing to their greater adaptability, controllability and more uniformly reliable product. As to the question of suitable resistors for electrically-heated furnaces which had been raised, he could say that there were now available metallic resistors capable of successful operation up to a temperature of 1,100 deg. C.

Lieut.-Col. VIGNOLES drew attention to the advantage of electricity for the heating of furnaces in small works, which were thus able to produce steel castings in comparatively small quantities at a low cost, and of a uniform quality that considerably reduced the proportion of rejects. The speaker also gave some extracts from a letter from Mr. Clothier, of Messrs. Reyrolle, Ltd., in which the latter pointed out that a comparison of the cost of coal and electricity for heating purposes was not a true criterion, there being in the case of electric current no fuel-handling costs to be taken into account. Mr. Clothier cited the case of 1¼-in. plates weighing 350 lb. which required to be straightened. The plate makers wanted an extra 50s. per ton for straight plates. Messrs. Reyrolle, however, decided to do the straightening themselves. At first coal-fired furnaces were used, the cost of straightening working out at 14s. 9d. per ton; this was, however, reduced to 13s. 9d. per ton when electric furnace heating was adopted. Moreover, with electric heating no time or labour cost was involved in getting the furnace up to the

required temperature for the commencement of operations at the beginning of the day's work as the current to the furnaces could be switched on by the night watchman at a predetermined hour, or automatically by a time switch.

Mr. R. J. Sargant considered that, notwithstanding the progress of oil and electrically-heated furnaces, they had not yet seen the death of solid fuel firing, and that in certain cases of which he had had experience the cost of electric heating was considerably higher than when oil was used, with no compensating improvement in the product.

Dr. Robert Mond, who expressed surprise at the delay which had occurred in the coal and metallurgical world in developing the long-distance transmission of coke oven gas, stated that his company was conducting experiments with both gas and electrically-heated furnaces for metallurgical purposes.

Section O: Transmission of Power.

Dr. C. Matschoss (Germany) presided on October 3rd, and pointed out that the problems involved in the study of energy transmission were not only technical but also legal and economic, and it was difficult to establish general rules which would apply to all countries, owing to the variety of laws and regulations, and the variety of existing plants. Electric cables would apparently enable one to transmit energy practically to any distance: there were already connections joining the Alps to the North Sea, and he expressed the hope that in the future there would be a general European interconnecting system.

Mr. F. S. Townend (general reporter) then presented his general report, which summarised the three papers that were submitted.

Mr. E. C. Evans (National Federation of Iron and Steel Manufacturers) confined his remarks chiefly to long-distance transmission of gas, with particular reference to conditions in Great Britain, where, at first sight, conditions seemed far more favourable for the development of the use of coke-oven gas for industrial and domestic supply than in Germany. It was not a question of technique or of cost: the difficulties inherent in the present system of legislation were such as would render it practically impossible for any non-statutory company to transmit gas for public supply for any appreciable distance. Mr. Jones, however, had pointed out a possible solution by means of amending legislation similar to the Electricity (Supply) Act of 1926.

Mr. H. V. Lloyd-Jones made further reference to statements made in his paper which might be open to misconstruction. The Electricity (Supply) Act, 1926, was not the only possible model on which a long-distance scheme could be framed, and ultimately it would be a matter of political policy rather than of legal difficulty.

Mr. Robert MacLaurin (Great Britain) considered the paper by Dr. Smith a very clever piece of pleading for the gas industry as against the electrical industry. Dr. Smith had put forward figures showing that the gas industry could distribute gas rather more cheaply than the electrical industry could distribute electricity: the question they were interested in, however, was whether the consumer would get his gas at a lower cost in consequence. A figure of about one-tenth of a penny had been given in the paper as representing the cost per therm of transmitting gas a distance of five miles, but from his (Mr. MacLaurin's) experience, the gas industry did not appear to be interested in savings of that order. Many years ago he had put forward to the gas industry a proposal for making cheap gas which, if adopted, would have reduced the cost of producing gas by 2d. or 3d. per therm. He had an interview with the gas manager at Glasgow, which lasted half-an-hour, after which the proposal was turned down. Then he was recommended to go to the Electricity Department. He saw Mr. W. W. Lackie (the then electrical engineer and manager at Glasgow), who brought in Mr. Archibald Page, and together they considered the figures he had put forward. After discussing them for two hours they had told him that if he could show a saving of one-tenth of a penny in the cost of production of gas for electricity generation it would be of great interest to them; subsequently the Electricity Department at Glasgow had recommended that the MacLaurin plant should be tried. Eventually, however, both parties had united and had agreed to experiment with the plant. That experience indicated a difference in the outlook of the electrical and gas industries, which needed to be emphasised. Those in the former industry were trained as scientists and were dealing in a scientific manner with their problems; those in the latter were playing around, and, having a monopoly, charged 3d. or 4d. more than they need do for their gas and did not care whether they saved 1d., 2d., or 3d. in the cost of production.

Dr Smith pointed out that his figures were prepared in conjunction with the Electricity Commissioners.

Mr. MacLaurin replied that the figures were perfectly correct.

Mr. Irwin Crookes (New Zealand) prefaced his remarks by expressing the hope that any legal disabilities applying to either the electrical or the gas industry in this country would be removed shortly, so that both would have a fair field, without favour. He then dealt with the cost of transmitting electrical energy, and said that when he read Dr. Smith's paper he had received some very serious shocks, for various ideas he had cherished for the last 25 years appeared to have been absolutely wrecked. Dr. Smith had indicated that the cherished idea of developing electrical power at the pithead was a myth from an economic point of view, and had stated that the complete replacement of present forms of domestic heat by electrical energy offered little, if any, saving; according to the figures given, the deductions appeared to be correct. He (Mr. Crookes), however, had had some little experience of the transmission of electrical energy, and based his conclusions on practical experience, not on arguments based on assumptions. In illustration of the point of view from which he regarded electrical transmission costs, he gave particulars of a small scheme with which he had been associated as engineer: power at 22,000 volts was transmitted over a distance of 25 miles; the line passed through many kinds of country, including dense forests, parts of which had to be cleared. The line was erected about 10 or 11 years ago, and the cost per mile was about £500, the total cost being, say, £13,000; the scheme was not a very big one; it involved the transmission of about 4,000 kW. By dividing £13,000 by 4,000, he arrived at a figure of £3 5s. 0d. per kW. The concern responsible for the line had paid a dividend of 7½ per cent. for a number of years previously, and, therefore, he had allowed 7½ per cent. for capital charges. Power transmission lines lasted a good many years, and he had allowed 2½ per cent. for depreciation, maintenance, &c. Thus, the total annual charge was 10 per cent., or £1,300, or the annual charge per kW was 10 per cent. of £3 5s. 0d., *i.e.*, 78d. That was the cost of transmitting 1 kW continuously for 365 days, for 24 hours a day, 100 per cent. load factor. The cost per kW-hour was obtained by dividing 78d. by the number of hours in the year, say, 8,700, which gave an exceedingly small figure, nothing like so large as the figures given by Dr. Smith, even if the load factor were reduced to 25 per cent.

Marine Electrical Machinery.

Marine auxiliary plant has reached an interesting period of transition which promises a future full of difficult problems.

By R. W. Allen, C.B.E.

(*Extracts from presidential address delivered before the* Institution of Mechanical Engineers.)

THE invariable tendency to-day is towards the utilisation of electricity for a greater number and variety of purposes. In addition to its usual employment for lighting and heating, electricity is used for steering gear, refrigerating plant, boat hoists and winches, windlass, fans for forced draught and ventilation purposes, laundry and bakery, wireless transmitters, and for pumps for lubrication, circulating water, bilge, sanitary, fire, and many other purposes. Present tendencies in both steam and motor-ships suggest that, in future, marine electrical installations will consist of a rather larger number of exactly similar units, thus facilitating the interchange of parts and enabling the power plant always to be run at a high degree of efficiency.

(1) A cruiser installation consists of a steam-turbine running at 6,000 r.p.m. driving an enclosed pipe-ventilated dynamo at 1,000 r.p.m. through helical gearing. The steam pressure is 250 lb. per sq. in. with 150 deg. F. superheat, and the output is 300 kW at 225 volts. A special feature is the use of aluminium for the gear and governor cases in order to reduce weight. The condenser is combined with the base-plate and the oil coolers are embodied in the gear-case. By driving the circulating pumps off the outer end of the dynamo shaft and the extraction pump off the turbine shaft the whole plant is made self-contained and remarkably compact. Forced lubrication is adopted throughout and the exacting duties of the various parts are met by the use of many special alloys; no fewer than twenty different materials are used in the construction of such a turbo-generator set.

(2) The oil-engine-driven auxiliary equipment in a steam-driven passenger liner consists of six-cylinder engines of 700 h.p. driving eight-pole dynamos with an output of 450 kW. The engines are of the four-stroke-cycle type and run at 250 r.p.m., and are remarkable for their perfection of balance and freedom from vibration, results gained by careful attention to both gravitational and torsional stresses in the various parts of the engine. A further consideration in marine work is the space occupied, and a reduction of length has been made to assist in the preservation of good balance by eliminating the tendency to torsional vibration. Steam-turbine-driven generators are also provided in this particular case for use as a standby.

Fuel economy has led to the use of greatly increased steam pressures for marine propulsion, and as far as possible the driving of all auxiliaries by electric motors. The latest example of progress in this direction is the new passenger liners of the Canadian Pacific Steamship Company. The

s.s. *Duchess of Bedford*, with a steam pressure of 350 lb. per sq. in. and a temperature of 680 deg. F., has a fuel-oil consumption of 0.6 lb. per s.h.p. for the propelling machinery and 0.64 lb for all purposes. Compared with vessels built in 1922 the *Duchess of Bedford* represents an advance of 50 per cent. in power on 10 per cent. less weight of machinery without any increase in the cubic capacity of boiler spaces or in the total daily consumption. Such a remarkable efficiency figure would seem to indicate that one of the main lines of future progress lies in the further development of high-pressure steam for main turbine propulsion and the driving of all auxiliaries by electricity derived from oil-engine-driven enerators.

(3) The oil-engine driven auxiliary equipment for a modern passenger motor-ship comprises four sets of 700-h.p. Diesel engines similar to those described as installed in a steam-ship. Six-pole 450-kW dynamos are coupled to the engines, which run at 250 r.p.m.

The natural conservatism of the marine engineer has tended to retard the introduction of any machine into marine service until it has shown its worth on land, and it is partly perhaps to this cautious attitude that we may ascribe the somewhat tardy entry of the steam-turbine into the field of marine auxiliaries. The oil-engine-driven auxiliary has had a rather more encouraging reception; in fact, matters are tending in the other direction, and we now have oil-engine-driven auxiliaries in ships propelled by steam.

Side by side with the development of design and the utilisation of new materials there has grown up the new science of management which, by concerning itself with works equipment, the training of men, the proper use of machines, and the introduction of new methods, has enabled us to cope with the requirements of the designers.

The training for all grades in the engineering industry is of the profoundest interest. It cannot be undertaken lightly and with motives of exploitation, but needs to be put in a paramount place in the employer's organisation and to be administered with vision and foresight if the industry is to recruit and train an adequate supply of men capable of carrying on the engineering traditions which are our heritage. Moreover, the extraordinary development of the mechanical engineering industry during the past twenty years, especially in relation to the magnitude of the business units and the mechanisation of the operations involved, has rendered it absolutely impossible to leave the training of young men to the chance methods of last century. So far is it from being true that minute subdivision of operations and the exact planning of those operations have reduced the necessity for apprenticeship, that they have on the contrary made it necessary to train every person employed and to give a broad and comprehensive training to a far greater number than hitherto.

If I could place side by side the 21-h.p. electric-lighting plant of H.M.S. *Thunderer* and the four 700-h.p. oil-engine generators which constitute the electric power station of a modern motor vessel, there would be no need to labour the argument that, in spite of all the machine-tool aids which modern science has provided, the necessity for training engineers of all types and grades, operatives, craftsmen, inspectors, planners, and administrative officers, is far greater to-day than it ever was before. Such a comparison would be equally effective in demonstrating the necessity for a much broader training, and, especially in the higher ranks, for the development of a type of mind capable of tackling problems on a larger scale and of infinitely greater intricacy than those which our forefathers were called upon to solve.

The Overhead Lines Association.

An account of the proceedings at the opening meeting of the winter session, and extracts from the presidential address.

At the annual general meeting of the Overhead Lines Association, which was held at the Institution of Electrical Engineers on Wednesday, October 17th, Mr. R. Borlase Matthews, the retiring President, delivered his presidential address, extracts from which are reproduced below. With the aid of a miniature kinematograph projector some moving pictures, taken in Scotland by the president and Mr. S. R. Mullard on the occasion of the I.E.E. summer meeting, were shown.

In moving the re-election of Mr. Theodore Stevens as hon. secretary, the President said that not only had Mr. Stevens acted as hon. secretary, but also as technical adviser to the Association, and in the double capacity had rendered immense services to the O.L.A. Mr. Stevens was unanimously re-elected.

The result of the ballot for the election of President, and members of Council, was as follows: President, Mr. W. Fennell; Council—Mr. J. H. C. Brooking, Major T. Rich, Mr. F. H. Clough, and Mr. F. Swarbrick; Associate Member of Council, Mr. C. O. Boyse.

"Second Comer."

A short discussion then took place with regard to "second comer," *i.e.*, the position as between the Postmaster-General and the supply authorities concerning the rights of those who first erected overhead lines in any particular area.

Mr. R. Borlase Matthews said there had been considerable correspondence in connection with this matter, and a special committee had been appointed to deal with the various points that had to be raised with the Postmaster-General. The object of the present discussion was to obtain any further suggestions that members might have to make as to the best policy that should be adopted as between the Postmaster-General and the supply authorities.

Major T. Rich remarked that as long as the law remained as it was at present, the Postmaster-General could adopt the attitude that anything he agreed to was a concession. There should be legislation which would make perfectly clear what were the rights of the two parties.

Mr. R. Borlase Matthews said that the matter would be left to the sub-committee to deal with. His own view was that, whilst they all appreciated what had been done, there was really required an Act of Parliament which would clear away any ambiguity so that whilst, on the one hand, the supply authorities should not have to ask concessions from the Postmaster-General, on the other hand, the Postmaster-General should not have to ask concessions from the supply authorities. The supply authorities must be recognised as public supply authorities, and he hoped the Association would be able to do something in getting such legislation passed.

Presidential Address.

By R. Borlase Matthews, Wh.Ex., A.M.Inst.C.E., M.I.E.E., F.R.Ae.S.

Formed in October, 1927, to meet an urgent need, the Association can look back with pride upon the accomplishments of the last twelve months. Essentially the Association has operated upon unselfish principles, for it has done far more good to the electrical industry as a whole than to its members as individuals. Your Council, bearing in mind the old adage that a child must learn to walk before he can run, has realised that it would be unwise to drastically alter rules, regulations, and legislation immediately, though many of them circumscribe the efforts of the engineer who really knows his business. While every good engineer will bear in mind the slogan "Safety First," it must obviously be tempered with reason. Some risk must be borne by the public, and it is as well that it should be so, for it encourages people to think.

Earthing.

Among the new problems that need solution is that of adequately earthing lines transmitting considerable power at very high pressures. Several new factors have come to light during the past few months, in particular the danger due to induction, and two accidents occurred recently in which men working on telephone lines were killed; in one case the telephone line was many miles away from the power lines.

Closely allied with this subject is the method of providing protection in the event of three-phase overhead lines falling. Hitherto it has been accomplished most successfully with the aid of protective relays operated by pilot wires. The cost of the latter is, however, excessive, and of late serious attention has been given to other methods, the most promising of which depend upon the principle of out-of-balance caused by the earthing of one of the phase wires, causing relays to come into operation.

Behaviour of Copper Wire.

Recent work in connection with the behaviour of copper wire under high tension is of particular interest, as it has been shown that, though a tension considerably above the limit of elasticity produces permanent elongation, it raises, at the same time, the limit of proportionality of the material, besides which the breaking limit is also increased; while the modulus of elasticity is not greatly effected, it is increased to some extent. This work has shown what is at least a fact that has not hitherto been sufficiently appreciated, namely, that the limit of proportionality of copper may be raised from 15.5 to 20.3 tons per square inch, as an increased tension improves the material. From the overhead line engineer's point of view these results are of the utmost importance, for a conductor heavily coated with ice may be subjected to a tension of from 18.5 to 22 tons per square inch, resulting in permanent elongation, with the result that the sag is increased

and the tension in the case of an unchanged load is reduced. At the same time, however, the material has been considerably improved, so that it is capable of again standing a similar tension, in which case the permanent elongation becomes considerably less. Therefore, such an overhead line which has noticeably sagged is still strong enough to be readjusted to the original sag. It also follows that the conductors can be strung to a higher tension than that which has hitherto been used, so that the permitted tension for copper lines may be estimated at from 9.5 to 10.8 tons per square inch, or possibly even more. It will thus be realised that as a result of these findings the following practical advantages are to be gained: (1) Owing to reduction in the sag of the line, the height of the poles can be reduced; (2) the risk of the lines becoming entangled is reduced; and (3) lines which have become permanently elongated, due to overloading with ice, hoar frost, &c., may be re-strung to their original tension without any deterioration in quality.

Rural Electrification Schemes.

In accordance with the national scheme proposed by the Electricity Commissioners for the Central Electricity Board, power at 132,000 volts will be supplied within the next few years from large centres, from which 33,000-volt transmission lines should radiate to 33,000/3,300-V (or in some special cases to 6,600-V) sub-stations in the rural areas, and from the latter lines should radiate to villages within a radius of two and a half miles, wherein sub-stations of 6,600 or 3,300/400/230 volts should be erected to supply consumers within a radius of 600 yards. The 33,000-volt lines should be ultimately arranged in loops.

Without taking wayleaves into account, the cost per mile of a 400-volt three-phase line should not exceed £180, while the 6,600- or 3,300-volt lines should cost approximately £213 (again without wayleaves). If the 3,300- and higher-voltage lines were erected in accordance with modern engineering practice instead of being based on the Electricity Commissioners' Regulations, the cost would not be more than £160 per mile (without wayleaves). The cost of the 33,000-volt lines would be about £343 (without wayleaves) when erected according to the requirements of the Commissioners, but they could be erected for £261 per mile (without wayleaves) if the rules of the Commissioners could be ignored; 33,000/3,300-volt sub-stations can be designed so as not to cost more than £600, while 3,300/400/230-volt sub-stations can be constructed for about £100.

In conjunction with Dr. A. Ekström, your president has recently prepared a scheme for the rural electrification of the greater part of the County of Lincoln, the first attempt made in this country to provide an adequate supply in a rural area along the lines of established practice in other countries. As the costs per mile of overhead lines and sub-stations appear to be very low according to British ideas, detailed particulars are given herewith which analyse the costs. They were prepared by Dr. Ekström, to whom all credit is due, for even if they were increased by, say, 50 per cent., the proposition would still be a very attractive one.

TABLE I.

Cost per mile of Overhead Lines.

	In accordance with El. C. regulations.			In accordance with modern practice.	
	400 volt line.	3.3-0 volt line.	33,000 volt line.	3,300 volt line.	33,000 volt line.
	span—230 ft.	295 ft.	295 ft.	295 ft.	295 ft.
	per mile.	per mile.	per mile.	per mile.	per mile.
	£ s.	£ s.	£ s.	£ s.	£ s.
Creosoted poles and stay-poles	45 10	73 5	91 5	44 16	57 19
Copper	74 5	80 0	81 0	61 0	61 0
Insulators, supports and caps	8 18	14 9	98 14	9 17	76 5
Sundry accessories ...	1 15	0 17	0 17	0 17	0 17
Assembling insulators, supports and caps ...	2 10	2 8	5 19	1 17	4 10
Fixing wires	4 14	4 8	6 13	3 10	4 19
Erecting poles and stay-poles	5 15	4 1	8 12	4 1	8 12
Transport of poles to site	6 9	5 5	8 12	5 5	7 3
Transport of copper supports, insulators, &c.	8 2	2 18	3 7	2 8	2 16
Transport on site ...	0 16	0 14	0 19	0 14	0 17
Protective devices ...	8 18	8 16	13 6	8 16	13 6
Railway crossings, 1 per 6 miles	1 12	1 12	2 8	1 12	2 8
Drawing office charges	2 4	2 4	4 8	2 4	4 8
Sundry tools and stores	0 17	0 17	1 15	0 17	1 15
Supervision	7 2	7 2	8 16	7 2	8 16
Administration, insurance, &c.	4 8	4 8	6 12	4 8	6 12
Cost per mile ...	£178 15	£213 4	£343 3	£159 4	£261 3

It is most important to observe that the cost of a 6,600/400/127-volt sub-station is only 10 per cent. more than the Table III total. Hence where the economical practice has hitherto been to employ 3,300 volts, an advantageous change can now be made to the higher voltage. It is probable that within the next few years further experience and investigation will reduce the cost of 11,000-volt switchgear, &c., to a very similar price, and thus further reduce distribution costs.

TABLE II.

33,000/3,300-Volt Sub-station Detail Costs.

	£	s.	d.
Transformers—			
1 for 33/3.3 kV, 200 kVA, complete, including oil	185	15	0
3 current trans. on 3.3-kV side	8	6	0
1 three-phase potential trans., 3,300/110 V, including fuses	11	15	0
1 single-phase potential trans. for leakage-current relay	6	8	0
Relays—			
3 overload	10	6	0
1 leakage current	7	1	0
1 time limit	7	6	0
Switches—			
1 oil, 33 kV breaking capacity, 1,000 A	69	13	0
15 links on 3.3-kV side	14	6	0
9 links on 33-kV side	18	10	0
Cable boxes—			
2 for 33 kV, including compound	23	4	0
4 for 3.3 kV, including compound	6	0	0
Instruments—			
1 kWh meter, 110 volts	5	10	0
1 voltmeter	3	12	0
2 earthing plates	5	10	0
Kiosk of steel plate	143	0	0
Installation costs	56	15	0
Transport	17	3	0
Total	£600	0	0

The following are probably the main reasons why poles erected according to the Commissioners' rules are so much more expensive than when erected according to modern engineering practice: (1) The Regulations call for the use of poles considerably longer and thicker than those actually required, owing to the assumption of the low mechanical strength of copper and the high value placed on the modulus of elasticity; (2) the height of the conductors above the ground, and (3) the tension of the conductors. There is a considerable difference between the cost referred to above of the 33,000-volt

TABLE III.

3,300/400/230-Volt Sub-station Detail Costs.

	£	s.	d.
1 transformer, 20 kVA, 3,300/400/230 volts	17	16	0
1 switch, combined with fuses on 3.3-kV side	6	13	0
4 switches, triple and 4 links on 400-V side	5	11	0
12 fuses, 400 V (500 V, 60 A)	1	12	0
1 cable box on 3.3-kV side, including compound ...	1	8	0
1 board	0	11	0
1 kWh meter	5	11	0
Earthing plates	5	11	0
1 kiosk of steel plate, including base-plate	49	16	0
Installation costs	4	3	0
Transport	1	8	0
Total	£100	0	0

line and the 6,600- or 3,300-volt lines, and thus the introduction of the intermediate voltage results in a considerable saving in the capital expenditure. Its use is also of considerable advantage in rural electrification work when a large number of villages is dealt with, for disturbances on the low-voltage circuits are limited to the 6,600- or 3,300-volt systems, leaving the 33,000-volt system untouched. An 11,000-volt system is not so suitable for rural distribution as for bulk supply to small towns, on account of the increased capital costs of the transformers, switchgear, &c.

Electricity Progress in New Zealand.

At the recent annual conference of the New Zealand Electric Supply Authority Engineers' Association, the new president briefly reviewed the present position with regard to electricity supply in the Dominion. In the course of his remarks he stated that owing to the increased capital charges that had been met, the past year had been a very critical one for many supply authorities, this being especially the case with those in their second, third, and fourth years of operation. While some Boards were still in financial difficulties, considerable progress had been made in general by all the electrical undertakings in the Dominion. The use of electricity was progressing rapidly and the saturation point was still a long way off; official figures were not available for 1927, but the available statements indicated a great advance on the previous year. As one indication, he stated that the number of electric cooking ranges in use had increased from 8,578 to 13,147 during the period from March, 1927, to March, 1928. Notwithstanding some adverse criticism, the Electric Power Board Act had, in the speaker's opinion, proved itself to be an outstanding piece of legislation in the service of the community, and with respect to electricity supply in rural areas it had placed the Dominion in a leading position.

New Electrical Devices, Fittings, and Plant.

Readers are invited to submit particulars of new or improved devices and apparatus for publication in this Section.

An Electric Iron Conversion Frame.

The popularity of the electric iron is likely to be still further increased if the idea behind the production of the "Utility Frame," fig. 1, particulars of which we have received from Mr. James Edgar, borough electrical engineer, South Shields, is proved sound. The frame is so designed that an inverted electric iron can be inserted in the cradle and so form a hot-plate for cooking purposes. Actual tests have been made, and a 4½-lb. joint, we understand, has been cooked at slightly under 1d., with electricity at 1d. per unit. Various other experiments have been carried out, and bacon and eggs, steak, chops, sausages, and fish have been cooked successfully. The apparatus is provisionally protected and the final patents will be completed soon, when it is hoped to have the frame placed on the market.

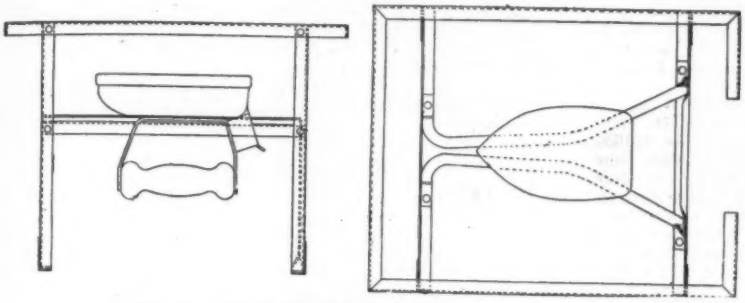
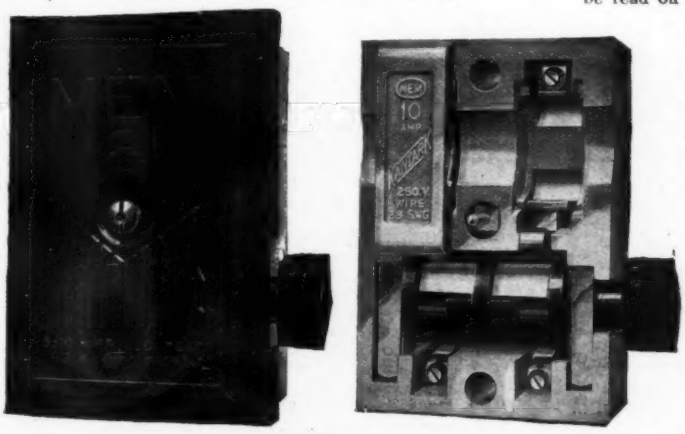


Fig. 1.—The "Utility Frame."

An All-Insulated Switch Unit.

We have received from the Midland Electric Manufacturing Co., Ltd., Barford Street, Birmingham, a sample of a particularly neat and compact all-insulated d.p. switch fuse unit. The combination is rated at 5 to 10 A, 250 V, but the medium rating is 8 A—hence the name, "MEM8." It is claimed that the unit is the smallest, most effective, and least expensive combination at present available. It is suggested that "MEM8" is suitable for use as a main service switch for small houses and tenements, and for assisted wiring schemes, and that the fact that earthing is unnecessary makes for economy in erection, thus giving great advantages over ironclad apparatus. The unit, figs. 2 and 3, measures 4½ in. by 3½ in. by 2 in., and is very attractive.



Figs. 2 and 3.—"Mem8" Switch-Fuse Unit—with Cover and Open.

A New Street-lighting Fitting.

The accompanying illustration, fig. 4, shows a new type of street-lighting fitting which has been developed by Messrs. Siemens Electric Lamps & Supplies, Ltd., 38-39, Upper Thames Street, E.C.4, specially for use with "Silvalux" lamps. The fitting consists of a cast canopy surmounting a vitreous-enamelled reflector specially designed to assist in the distribution of light at an angle of approximately 15 deg. below horizontal. The fitting is supplied in two sizes, one suitable for 100- and 150-W lamps, and a larger size for 300-W lamps. The larger fitting is equipped with a clear glass cylinder which protects the upper surface of the lamp bulb from driving rain, and this cylinder has a negligible absorption factor, so that the overall efficiency of the complete unit is of a very high order.

Fig. 4.—"Silvalux" Street Lighting Fitting.

An Illumination Intensity Meter.

With the object of providing a simple means of checking up the illumination intensities in connection with large lighting installations, Messrs. Philips Lamps, Ltd., 145, Charing Cross Road, W.C.2, have introduced a meter which is designed to give measurements directly in foot-candles. The instrument (fig. 5) is of simple construction, and employs a lamp operated by two 4½-V flash-lamp batteries in series. The lamp is placed under an accurately graded scale and lights up when a small button is pressed. The meter is simply placed where it is desired to measure the illumination, and the foot-candles can be read off the scale. The lamp referred to is controlled by a special resistance lamp which automatically regulates the current flowing through the main lamp, thus ensuring that the main lamp gives constant illumination to the scale, so that there is no danger of obtaining fallacious readings owing to the batteries running low. In addition to this precaution, another lamp is placed in the circuit as a pilot device, and upon pressing the test button this should glow red. The scale of the meter covers from 0.1 to 40 foot-candles. By the use of a small lever it is possible to reduce the light emitted by the lamp to one-tenth, in which case the scale reading must be multiplied by 0.1 in order to obtain the true value. In this way readings up to 4.0 foot-candles are facilitated. The meter is of sturdy manufacture, and is claimed to be a well-made and reliable instrument.

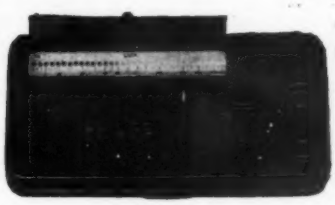


Fig. 5.—A Foot-Candle Meter.

The Physical Society's Exhibition.

The nineteenth annual exhibition of electrical, optical and other physical apparatus is to be held by the Physical Society and the Optical Society on January 8th, 9th and 10th, 1929, at the Imperial College of Science and Technology, South Kensington.

Correspondence.

Correspondents should forward their communications as early as possible. *No letter can be published unless we have the writer's name and address in our possession.*

Insulating Oils.

I have read your note on my letter in your issue of the 12th and your contributor's reply of October 13th, and submit that neither touches the point. It is no answer to say "Naughty, naughty!" and I cannot agree that misrepresentation in an influential journal is not damaging to the B.E.S.A. and to the objects of the promoters of the B.E.S.A. Specification.

Your contributor suggests that it is bigotry to claim that a B.E.S.A. Specification is the last word. I made no such claim, but I claim that it is the latest authoritative word, and again submit that if your contributor believes himself to be in possession of something better it is up to him to prove it. There is scarcely a paragraph in your contributor's article which does not in some part run counter to the B.E.S.A. recommendations or to the experience of those who prepared them.

Your contributor now explains that his intention was to help those who cannot carry out the B.E.S.A. tests. This hardly justifies errors and omissions, and leaves us with a rough and ready test for presence of water and for flash point and resin, the last-mentioned superfluous. As for the first-mentioned, your correspondent admits that it detects the presence of one part in 50,000 of water in oil, which might therefore have an electric strength far above that required to pass the Specification. At the same time he puts forward for acceptance a lower limit than that in the Specification. It follows that his test would condemn oil that he agrees ought to be accepted.

My original criticism was not directed, however, to your contributor so much as to yourself. It is to you we look for suppression. Your readers, however pontifically disposed, cannot exercise editorial functions.

E. B. Wedmore,
(Director and Secretary,
British Electrical and Allied Industries Research Association.)

London, *October 19th*, 1928.

[We have no objection to criticism, but we resent insult. Does our correspondent realise the significance of the verb "to foist"?—Eds. Elec. Rev.]

Electric Light as a Lure for Insects.

The reference in your issue of September 28th to the use of electric light as a moth destroyer reminds me of how we used to destroy the flying ant in China, by placing bowls of water under the electric light fittings and sitting in semi-darkness to avoid the clouds of these insects which flew into the houses at certain seasons, attracted by the light.

At such times they shed their wings, and I believe I am correct in stating that the grub which remains is that of the dreaded white ant which is so destructive to wooden beams, &c., used in building construction, furniture, and other wooden articles.

H. A. Nott.

H.M. Dockyard, Gibraltar,
October 8th, 1928.

Hot Spots in Transformers.

Advertisements of a transformer manufacturer concerning "hot spot" temperatures in transformers have appeared in recent issues of the Electrical Review.

These advertisements commence with the statement that "Much has been written recently on 'hot spot' measurement and indication," and go on to state that certain transformers are designed without "hot spots"; that "'hot spot' indicators are an anomaly," and that "the ordinary thermometer provides adequate safeguard."

Since I have "written recently on 'hot spot' measurement and indication" in the *Journal* of the Institution of Electrical Engineers (August issue), I feel directly concerned with these statements.

The advertisements presumably refer only to oil-immersed transformers. The whole problem of cooling such transformers is to transfer the heat generated in the conductors and iron core of the transformer to the surrounding oil, and thence to the water, or ambient air, whichever is the cooling medium. Heat cannot possibly flow from the windings to the oil unless the temperature of the windings at any point is higher than the temperature of the adjacent oil.

The temperature of the hottest part, or parts, of the windings, *i.e.*, the "hottest spot" temperature, must always be higher than the temperature of the hottest oil. In this respect it does not matter how the temperature within the windings varies. The vague guarantee given in the advertisement is, therefore, irrelevant, whatever its interpretation.

The essential point is that the maximum safe load which the transformer will carry thermally is determined entirely by its "hottest spot" temperature. The temperature of the hottest oil under operating conditions is not a reliable guide, and will most often be positively misleading.

To say that any transformer can be built without a "hottest spot" is to show ignorance of the fundamental principles of heat flow and thermal transference. Moreover, if hottest-spot temperature indicators were "an anomaly and unnecessary expense" their use would not have been recognised and legislated for in the proposed revision of the Standard Specification for Transformers of the American Institute of Electrical Engineers. Incidentally, this same revision states that "loading apparatus on the basis of oil temperature alone as a guide is not recommended."

The true thermal rating of any transformer of good design under normal operating conditions is considerably greater than its British Standard rating. The hottest spot temperature indicator in its more useful form, the safe load indicator, makes available this extra transformer capacity. The oil temperature is no guide in this respect. A 500-kVA transformer, for example, if fitted with a safe-load indicator, becomes in effect a 600/700-kVA transformer.

All these matters are explained fully in the Institution paper referred to above.

E. T. Norris.

Chorlton-cum-Hardy, *October 16th*, 1928.

Electromagnetic Forces.

We have read Mr. W. F. Dunton's letter in your issue of the 28th ultimo. We have not seen the American publication to which he refers, but his reference to Wedmore & Trencham's book is not fair criticism. We give no rule, merely deductions from matter which can be found in Thompson's Elementary Lessons. The cases worked out are clearly defined and, as we say, "with a little common-sense will give a very good idea of the forces to be dealt with."

We submit that it is not common-sense to apply without any allowance a formula for b infinite and h finite to a case where b is $\frac{1}{4}$ h. Further, it happens that in fig. 146 on the same page we illustrate a case approximating to Mr. Dunton's example, and say that in this case the force is relatively negligible. How then do we mislead our readers?

It would appear that if this extreme case were treated by Dunton's rule, *i.e.*, treating the structure as a rectangle, one could hardly expect a close estimate. Common-sense would save us from such a blunder, but why cannot it save Mr. Dunton?

In case anyone still has the temerity to read our book, we would mention (to save Mr. Dunton the trouble) that our formulæ apply to a.c. and the maximum force, and this is so wherever the constant 9 appears. For d.c. and average force 9 should be replaced by 4½.

E. B. Wedmore,
H. Trencham.

London, *October 19th*, 1928.

Charges for Water-storage Heating.

In your current issue I would particularly draw your readers' attention to the following:—

Page 666.—"Generally, domestic electric water heating is not yet a commercial proposition." Regret is expressed that lack of a simple tariff is decidedly the stumbling block to progress.

Page 646.—Dr. Fishenden points out that several stations have reduced coal costs to 0.16d., and suggests selling at or below 0.35d. *during suitable periods*, to improve load factor and thus reduce overhead charges.

Page 655.—Mr. W. H. Alabaster states that electricity could be sold at ½d. *during* 10 *hours of night time.*

Every engineer stresses the desirability of this class of load. Then, obviously, it must be sold at a reasonably competitive price. If coal costs 0.16d., then 0.25d. for sales during night hours shows a gross profit of 25 per cent.

Is it not better business to *easily sell* millions of units (at a time when it costs next to nothing to convey) at a gross profit of 0.05d. than to *struggle to sell* part of a million at a much higher profit? A quick sales and low returns policy has made many a concern, and electricity at 0.25d. would have a rapid sale, for it would be equal to gas at less than 5d. per therm.

G.

October 20th, 1928.

The Standardisation of Supply Pressure.

Everybody appreciates the great advantages of a standard voltage, for which it appears that 230 volts has been chosen, and we see in the Review that several undertakings which have recently been inaugurated have either adopted, or been made to adopt, this voltage. No doubt all undertakings will have to come to this voltage sooner or later, therefore it would be interesting to know exactly why a few towns which

are about to be given a new supply, or which have just started a supply, have adopted 250 volts.

The only argument, apparently, in favour of the higher voltage is the saving of copper, but when the change *does* come, will it not cost more to change to 230 volts than to start with 230 volts, and spend a fraction more on copper at the outset?

Are the Electricity Commissioners aware of the fact that 250 volts is being adopted, or have they sanctioned it, and if so, why?

This policy would not appear to be conducive to reducing the cost of a change of voltage when the time for such *does* come (and the sooner the better in most respects).

Any enlightenment would prove interesting to anyone who has to stock the usual sizes of lamps and other apparatus, this quantity being multiplied by the number of voltages existing in the surrounding districts, often at least three!

Here is a good case where standardisation of voltage is *most* desirable, to say nothing of the fact that costs of apparatus—already high—would no doubt be reduced if only one voltage were available.

Standardisation.

October 20th, 1928.

[The adoption of a uniform pressure at consumers' terminals is probably the most important matter in connection with the standardisation of electricity supply to-day, but progress towards its accomplishment is very slow. In our opinion no new undertakings should be allowed to adopt any other voltage.—Eds. Elec. Rev.]

Published Specifications.

Compiled expressly for this journal by a firm of chartered patent agents. The numbers in parentheses are those under which the specification will be printed and abridged and all subsequent proceedings will be taken.

1927.

8,348. "Three-wire electrical distribution systems." J. Roberts. March 26th, 1927. (297,714.)

10,056. "Mechanism for converting an oscillating movement into a step-by-step rotational movement, particularly applicable to electric clocks." S. J. Smith. January 12th, 1928. (297,891.)

14,196. "Electric switchgear." British Thomson-Houston Co., Ltd., and P. H. Harding. May 26th, 1927. (Cognate application 16,849/27.) (297,783.)

16,357. "Synchronising means for printing and like telegraphs." W. E. Beatty (Bell Telephone Laboratories, Inc.). June 20th, 1927. (297,696.)

16,376. "Apparatus for generating electrical energy from wave-movement of the sea." O. H. Parsons. June 20th, 1927 (297,720.)

16,901. "Combined switch and holder for incandescent lamps and other electrical fittings." B. A. Spaull. June 24th, 1927. (Cognate application, 20,752/27.). (297,701.)

16,911. "Electric protective systems." A. Reyrolle & Co., Ltd., R. W. Biles, and R. C. Atkins. June 25th, 1927. (297,702.)

16,944. "Diaphragms." W. E. Beatty (Bell Telephone Laboratories, Inc.). June 25th, 1927. (297,707.)

16,960. "Electrical signalling systems." E. G. Gage. June 25th, 1927. (297,709.)

17,072. "Electrical frequency stabilisers or time-control systems." J. A. Smale. June 27th, 1927. (297,762.)

17,146. "Electric fuses." A. Reyrolle & Co., Ltd., and W. J. Cook. June 28th, 1927. (297,786.)

17,182. "Electrical condensers." H. W. Sullivan, Ltd., and W. H. F. Griffiths. June 28th, 1927. (297,787.)

17,234. "Apparatus for regulating and controlling the output of electric transformers, sub-station equipments, electric generators, and the like." G. Wilkinson. June 29th, 1927. (297,862.)

17,316. "Manufacture of fuseheads for electrical firing." W. O. Littlebury and Imperial Chemical Industries, Ltd. June 29th, 1927. (297,869.)

17,327. "Signalling systems." Western Electric Co., Inc. June 30th, 1926. (Addition to 239,745.) (273,730.)

17,526. "Polarised electromagnetic resonance apparatus." O. Muck. July 1st, 1927. (297,882.)

17,709. "Devices for the interconversion of mechanical and electrical vibrations." British Thomson-Houston Co., Ltd., A. P. Young, and J. Hutt. July 4th, 1927. (297,894.)

17,710. "Electro-responsive indicating apparatus." British Thomson-Houston Co., Ltd., and W. H. Lawes. July 4th, 1927. (297,895.)

17,747. "Telephone systems." Associated Telephone & Telegraph Co. September 11th, 1926. (277,298.)

18,817. "Electrical accumulators." W. Haddon and J. A. Fullilove. July 15th, 1927. (297,904.)

19,235. "Electric switches." H. S. Cooke. July 20th, 1927. (297,908.)

20,423. "Remote control of valve filaments in wireless sets." F. S. Angel. August 2nd, 1927. (297,918.)

20,706. "Signals or indicators for controlling traffic." G. A. H. Wootton. August 5th, 1927. (297,921.)

22,147. "Devices for closing electrical circuits at intervals." Siemens Bros. & Co., Ltd., and W. G. Patterson. August 23rd, 1927. (297,934.)

22,165. "Electric driving arrangements, particularly adapted for vehicles." British Thomson-Houston Co., Ltd. August 23rd, 1926. (276,377.)

22,700. "Magnetic alloys." W. E. Beatty (Bell Telephone Laboratories, Inc.). August 29th, 1927. (297,938.)

22,879. "Railway traffic controlling apparatus." Westinghouse Brake and Saxby Signal Co., Ltd. (Union Switch and Signal Co.). August 31st, 1927. 297,945.)

23,146. "Electric cables or attachments for use in connection therewith." Callender's Cable & Construction Co., Ltd., and P. V. Hunter. September 3rd, 1927. (297,947.)

23,635. "Bonding device for the lead covering of electric cables." H. F. J. Thompson. September 8th, 1927. (297,950.)

23,977. "Electric circuit breakers." W. A. Coates and Metropolitan-Vickers Electrical Co., Ltd. September 12th, 1927. (297,955.)

24,985. "Adaptors for electrical pick-ups." T. Hough. September 22nd, 1927. (297,965.)

25,139. "Vacuum electric tube devices." E. Y. Robinson and Metropolitan-Vickers Electrical Co., Ltd. September 23rd, 1927. (297,966.)

25,201. "Plug-in contacts for electrical circuits." R. T. Waite. September 24th, 1927. (297,967.)

25,763. "Miners' safety and other electric lamps." Oldham & Son, Ltd., and G. H. Darby. September 29th, 1927. (297,973.)

25,979. "Joining of telegraph and similar tape." E. C. R. Marks (J. A. L. Horn and J. H. M. Christensen). October 1st, 1927. (297,576.)

27,036. "Insulation of electric conductors." Siemens Bros. & Co., Ltd., and E. R. Hubbard. October 12th, 1927. (297,582.)

27,075. "Generation of ultra-short electric waves." Dr. A. Esau. October 29th, 1926. (279,821.)

27,225. "Electrical connectors." B. H. Roper. October 13th, 1927. (297,986.)

27,424. "Differential protective system for electrical machinery and apparatus." Allmanna Svenska Elektriska Aktiebolaget. April 12th, 1927. (288,562.)

28,144. "Anodes for gas-discharge vessels." Siemens & Halske Akt. Ges. October 23rd, 1926. (279,501.)

28,508. "Combined transformer rectifiers and accumulators for use with alternating electric current." Soc. Anon. des Accumulateurs Monoplaque. December 13th, 1926. (282,019.)

28,805. "Electrolyte for lead accumulators." Dr. M. Kugel. May 24th, 1927. (Addition to 280,197.) (291,020.)

29,056. "X-ray tubes and a method for operating the same." S. G. S. Dicker (Naamlooze Vennootschap Philips' Gloeilampenfabrieken). October 31st, 1927. (297,587.)

29,580. "Alkaline storage batteries." J. F. Monnot. November 4th, 1927. (297,996.)

29,792. "Engine-starting systems." Automatic Motor Stop & Start, Inc. November 6th, 1926. (280,241.)

30,632. "Electrical conductors." H. C. Anstey and T. Bolton. November 15th, 1927. (297,594.)

30,817. "Electric cooking appliances." J. B. Garty. November 16th, 1927. (228,000.)

31,245. "Control for electric furnaces." E. C. Glitzke. November 21st, 1927. (298,064.)

32,128. "Frequency relays." Allmanna Svenska Elektriska Aktiebolaget. April 1st, 1927. (288,125.)

32,403. "Methods of making continuous transformer or like windings." British Thomson-Houston Co., Ltd. December 28th, 1926. (282,730.)

32,871. "Sound reproducing." De Forest Phonofilms, Ltd. September 17th, 1927. (297,836.)

33,429. "Collapsible boxes or cases for holding electric and other bulbs." J. Brownlie and A. Horsley. December 10th, 1927. (Patent of addition not granted.) (297,603.)

34,889. "Electromagnetic relays." Siemens & Halske Akt.-Ges. March 15th, 1927. (287,109.)

35,137. "Electric clocks." Renard et Cie. December 29th, 1926. (282,800.)

1928.

793. "Protective and switching arrangements for electric distribution systems." H. A. H. Nijland. January 10th, 1928. (298,014.)

1,325. "Manufacture of electrical windings for helical winding slots." Siemens-Schuckertwerke Akt.-Ges. January 18th, 1927. (283,875.)

1,361. "Electric meters." Dr. W Burstyn. January 28th, 1927. (284,320.)

2,871. "Thermionic valve circuits for wireless reception." M. Von Ardenne. January 28th, 1927. (284,585.)

4,548. "Process of manufacturing incandescent cathodes for electric discharge devices." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. February 16th, 1927. (285,434.)

5,156. "Speed control and like systems." Marconi's Wireless Telegraph Co., Ltd. February 19th, 1927. (285,503.)

5,160. "Stator construction for dynamo-electric machines." British Thomson-Houston Co., Ltd. February 19th, 1927. (285,505.)

5,455. "Radio receiving systems." C. Lorenz Akt.-Ges. February 22nd 1927. (285,835.)

5,633. "Transformer house, having a pole built on the same." O. Jacobson and K. J. R. J. Rangford. August 13th, 1927. (285,570.)

5,834. "Recording methods and apparatus." British Thomson-Houston Co., Ltd. March 3rd, 1927. (286,299.)

6,364. "Method of telegraphing in Morse code, and apparatus therefor." R. L. A. Schoemaker. May 20th, 1927. (290,652.)

6,655. "High-frequency circuit arrangements." Marconi's Wireless Telegraph Co., Ltd. March 2nd, 1927. (286,279.)

6,832. "Safety fuses for screw plugs." Siemens-Schuckertwerke Akt.-Ges. March 23rd, 1927. (287,521.)

7,597. "Warning signals for vehicles." International General Electric Co., Inc. March 12th, 1927. (287,061.)

8,407. "Thermionic valves." W. R. Bullimore March 30th, 1927. (Divided application on 8,787/27.) (297,886.)

8,731. "Circuits for operating electric clocks over telephone wires." Vereinigte Bayerische Telephonwerke Akt.-Ges. March 23rd, 1927. (297,531.)

9,903. "Manufacture of accumulator plates." I. G. Farbenindustrie Akt.-Ges. May 9th, 1927. (Addition to 284,392.) (290,193.)

11,062. "Electric fuse holders for automobiles." J. W. Patrick. July 8th, 1927. (293,444.)

11,230. "Battery boxes." A. E. White (T. R. Palmer). April 16th, 1928. (298,054.)

13,311. "Current-collecting devices for electric railways and the like." Metallbank und Metallurgische Ges. Akt.-Ges. May 6th, 1927. (289,899.)

16,332. "Welding of rails." C. Stedefeld. June 3rd, 1927. (Patent of addition not granted.) (291,723.)

17,124. "Means for securing and ventilating the windings upon the revolving parts of high-speed electrical machines." Ateliers de Constructions Electriques de Charleroi. June 24th, 1927. (292,596.)

17,921. "Wireless signalling." Telefunken Ges. für Drahtlose Telegraphie. June 20th, 1927. (292,524.)

Trade Mark Applications.

The following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from October 17th :—

Rees Batteries (lettering and design). No. 490,582. Class 8. Electric batteries (not for medical purposes).—Diamco Gesellschaft, Berlin. (British representatives: Lloyd, Wise & Co., 10, New Court, Lincoln's Inn Fields, W.C 2.)

Vivaphone (lettering and design). No. 493,145. All goods in Class 8, but not including telephonic apparatus.—Radiophone (1933), Ltd., 22, Queen Street, E.C.4.

Euradio. No. 493,612. Class 8. Photometric appliances for use in measuring the intensity of ultra-violet rays.—C. C. Morrell, Hamilton House, High Road, Broxbourne, Herts.

Megostat No. 493,656. Class 8. Instruments and apparatus for use in radio-telephony and telegraphy.—Ingranic Electric Co., Ltd., 147, Queen Victoria Street, E.C.4.

Flambeaulux. No. 493,177. Class 13. Electric lamps (ordinary).—British Electric Lamps, Ltd., Spencer Hill Road, Wimbledon, S.W.19.

Tridelta. No. 493,909, and Triple Triangle (design only). No. 493,910. Class 16. Electrical insulators and parts therefor.—Hermsdorf-Schomburg Isolatoren Gesellschaft, Hermsdorf-in-Thuringen, Germany. (British representatives: Dicker, Pollak & Mercer, 20-23, Holborn, E.C.1.)

New Work for Contractors.

Particulars of new works and building schemes for the use of electrical installation contractors in search of work and all interested in the sale of electrical and allied plant and other products.

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

AIRDRIE.—Conversion of new Hippodrome into kinema; J. Scotland, architect.

ARGYLLSHIRE.—Extensions at Campbeltown Grammar School (£9,900); the headmaster.

BARNOLDSWICK.—Church (£18,000); Rev. J. Calderbank, vicar.

BIRMINGHAM.—Secondary school, Washwood Heath; secondary school for boys, Slade Road, Erdington; enlargement, George Dixon School (£26,850); Education Committee. 341 houses, Mill Farm estate, and 58, Fox Hollies estate; W. J. Simms, Sons & Cooke, Ltd. 48 houses, Ward End Park Road; C. Hougham. Extensions, Harborne 'bus depôt; T. Johnson.

BOURNEMOUTH.—37 houses, Lower Charminster site; W. and A. Hawkes. Church, Calvin Road; Pastor W. G. Stalley. Church of St. Francis of Assisi; Canon A. P. Annand.

BRADFORD.—Reinstatement after fire; J. & C. Crabtree, Ltd., commission woolcombers, Ladywell Mills.

BRISTOL.—44 houses, Bloomfield Road, Brislington; E. H. W. Wilmott.

BUTE.—Territorial buildings at Millport; Major A. M. McKinlay, architect, Rothesay.

CANTERBURY.—Motor showrooms, service station, and garage, New Dover Road, for Maltby, Ltd., Folkestone; H. Anderson, architect.

CARLISLE.—Aerodrome; Corporation and Air Ministry.

CASTLEFORD.—Conversion of premises into maternity hospital, for the U.D.C.; Fred Scatchard, architect, Midland Bank Chambers.

CLYDEBANK.—Swimming baths (£40,000); burgh surveyor.

COLCHESTER.—Housing scheme (337), for the T.C.; borough surveyor.

CUMBERLAND.—Mental institution; Cumberland and Westmorland County Councils.

DARENTH.—Workrooms, Training Colony (£9,625); Metropolitan Asylums Board.

DUNFERMLINE.—Concert hall, for Carnegie Dunfermline Trustees; Sir George Washington Browne, architect.

EPSOM.—Housing scheme (34), Ashtead, for the R.D.C.; surveyor.

GARSTON.—School (£17,305), for Herts. E.C.; county surveyor, Hatfield.

GLASGOW.—80 houses, Tollcross and Shettleston estates; housing director. Works extension, Craignestock Place; James Templeton & Co.

GRANGEMOUTH.—Shops and office, for Co-operative Society (£3,000); the manager. Extensions, for Scottish Dyes (£6,000); the manager.

GRANTHAM.—Police station, weights and measures office, &c., and additional 44 houses, for the T.C.; borough surveyor.

GREENOCK.—Suite of halls, for Trinity U.F. Church; the minister.

HEMEL HEMPSTEAD.—Additional 80 houses, for the T.C.; borough surveyor.

HEREFORD.—Reconstruction and extension of the General Hospital (£60,000), for the Board of Management; secretary.

HORNCHURCH (Essex).—Houses (53), Rainsford Way, for T. Clark; houses (24), Northumberland Avenue, for L. W. Richardson; houses (30), Hazelmere Gardens, for Standen Bros.

LEEDS.—School, at Osmondthorpe (first section, November 20th); Education Offices (architect's section), Calverley Street. Tenders to J. Graham, Director of Education.

LONDON (N.W.).—Extensions, North-Western Hospital; Metropolitan Asylums Board.

(Camberwell, S.E.).—Buildings, site of 328-330, Camberwell New Road; London General Omnibus Co., Ltd.

(Woolwich, S.E.).—Houses (121), Eltham, for the T.C.; James Byrom, Ltd., builders, Bury, Lancs.

(S.W.).—Isolation accommodation, Fountain mental hospital; Metropolitan Asylums Board.

(Fulham, S.W.).—Kinema and shops, corner Fulham Road and Fulham Palace Road; Yates, Cook & Darbyshire, 43, Great Marlborough Street.

(Ealing, W.).—Houses (100), Pope's Lane, for the T.C.; W. R. Hicks, surveyor. Houses (113), King's Avenue, Greenford; H. S. Bostock, architect. Extensions to town hall (£66,900); A. W. Johnston, architect.

LUDLOW.—Housing scheme (50), Craven Arms, for the R.D.C.; surveyor.

LYMM.—Business stores, for the Warrington Co-operative Society, Ltd.; C.W.S. architect, 1, Balloon Street, Manchester.

MANCHESTER.—Tuberculosis dispensary (£24,000); city medical officer of health. Offices, shops, &c., Oxford Road and Chester Street, for E. Nove.

MARGATE.—Re-erection (after fire) of Queen's Court Hotel, Eastern Esplanade, for L. Hart.

MERTHYR TYDFIL.—Wine and spirit stores, lighted by electricity, for D. Morgan & Co., Wellington Street.

NEWCASTLE.—42 houses, Barrack Road; Sutton Dwellings Trust. Rehousing, Elswick area (£98,000); city engineer. Church, vicarage and parish hall, Whinney Field Road; Council of Christ Church, Walker.

NEW MALDEN.—School, for Surrey E.C.; W. W. Finny, secretary, Kingston-on-Thames.

NEWPORT (Isle of Wight).—Mineral water factory, St. Cross, for Mew, Langton & Co.

OLDBURY.—Additional 94 houses, Galton estate, for the U.D.C.; surveyor.

OLDHAM.—Primitive Methodist church, Healds Green; C. T. Taylor, Roberts & Bowman, architects, 10, Clegg Street.

PLYMOUTH.—Congregational church, Randwick, Oreston; trustees.

PORTSMOUTH.—Development, Winchester College estate; Frank Bevis, Ltd.

RAMSGATE.—Electric lighting installation, Haine Hospital, for the Isle of Thanet Joint Hospital Board; E. W. Monkhouse, of Burstall & Monkhouse, consulting engineer, 14, Old Queen Street, London, S.W.1.

REDCAR.—Post office and telephone exchange, for H.M. Office of Works, King Charles Street, London, S.W. (returnable deposit of £1 1s.).

REETH.—Adaptation of institution as mentally defectives' home; clerk to Board of Guardians.

RICHMOND (Surrey).—Houses (26), Manor Road estate; borough engineer (returnable deposit £1 1s.). Extension of celluloid factory, for Acetate Products Corporation, Ltd., Pontifex House, Shoe Lane, London, E.C.4.

ROTHERHAM.—Church at Clifton; Rev. Canon Allen, vicar of Rotherham.

SKEGNESS.—Police court house (£4,100), for Lindsey C.C.; clerk.

SKIPTON.—Extensions, Grammar School (£10,000); governors.

SLOUGH (Bucks.).—Extension of factory, for Acetate Products Corporation, Ltd., Pontifex House, Shoe Lane, London, E.C.4.

STAFFORD.—Isolation hospital; County Council. Housing scheme (62), Stone Road estate, for the T.C.; W. Plant, borough engineer (returnable deposit of £1 1s.).

STOCKPORT.—Works, Redhouse Lane, Disley, for the British Block Printing Co. (£35,000 to £40,000).

STOKE-ON-TRENT.—Mental institution, Stallington Hall; city engineer.

STRATFORD-ON-AVON.—Housing scheme (100), for the T.C.; borough surveyor.

SURBITON.—Telephone exchange, Ewell Road, for H.M. Office of Works, King Charles Street, London, S.W.

SWANSEA.—26 shops and houses, Gower Road and Dillwyn Road; J. Oliver Watkins.

THORNABY-ON-TEES.—Additional 50 houses, for the T.C.; borough engineer.

TONBRIDGE.—Additional 28 houses, for the U.D.C.; surveyor.

TORQUAY.—Additional housing scheme (200), for the T.C.; borough surveyor. Isolation hospital extensions (£11,700), for the T.C.; borough surveyor.

TROWBRIDGE.—Creamery, for the Mid-Wilts. Creameries.

WAKEFIELD.—Central welfare centre; Special Corporation Committee. 100 houses, Eastmoor, 50 Portobello estate, and 50 Lupset estate; city architect. 56 houses, off Balne Lane; J. P. Firth.

WESTON (Runcorn).—School, for Cheshire E.C.; county architect, Preston.

WIGAN.—St. Stephen's Church, Whelley (£9,220); Austin and Paley, architects, Lancaster; Webster & Winstanley, builders. Electricity showroom, offices, &c. (£6,000), for the T.C.; borough surveyor.

WOLVERHAMPTON.—Gramophone factory, for Symphony Gramophone and Radio, Ltd.

WREXHAM.—Market stores and shops (£5,466), for the T.C.; John England, borough engineer.